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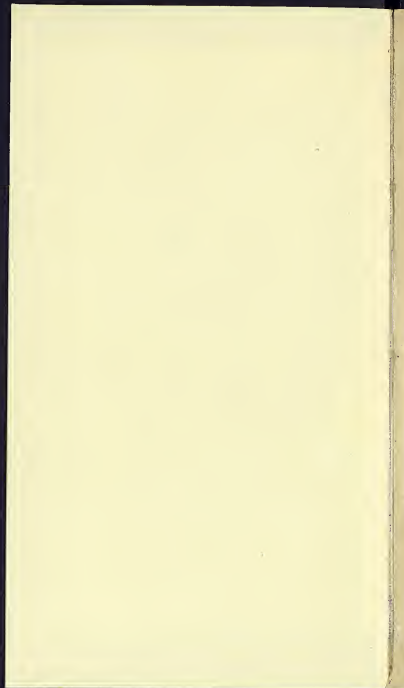
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THE HOP FARMER;

OR,

A COMPLETE ACCOUNT

OF

HOP CULTURE,

EMBRACING ITS

History, Laws, & Uses;

A THEORETICAL AND PRACTICAL INQUIRY INTO

AN IMPROVED METHOD OF CULTURE,

FOUNDED ON SCIENTIFIC PRINCIPLES.

TO WHICH ARE ADDED, SEVERAL

USEFUL TABLES & CALCULATIONS,

NECESSARY AND SERVICEABLE TO

THE GROWERS, FACTORS, SPECULATORS, AND
CONSUMERS OF HOPS.

By E. J. LANCE,

AUTHOR OF "THE GOLDEN FARMER," "THE COTTAGE FARMER," AND
SEVERAL PARTS OF "BAXTER'S LIBRARY OF AGRICULTURAL
AND HORTICULTURAL KNOWLEDGE," &c.

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The Statistical Tables, being Chap. VIII., may be purchased separately.

1838.

LONDON :

JOSEPH ROGERSON, PRINTER, 24, NORFOLK-STREET, STRAND.

P R E F A C E.

THIS Treatise on the Hop is offered to the English Farmer as a humble endeavour to place its culture on scientific and rational principles.

The subject having been incidentally mentioned in "The Golden Farmer," has called forth demands from the hop-growers for something more complete in respect of it. The observations of scientific friends, as well as the results of experiments by cultivators of the plant, have prompted the Author to put together, in a convenient form, the following pages, in which will be found (it is hoped) every information which can be desired, either by the practical man or by the tyro in hop culture.

The Tables on the Hop Duties, and for calculating an unpublished duty, will be found not the least valuable feature of the Essay; a Table is also added for computing the sale of hops, or any other goods, from 45s. to 327s. 6d. per cwt.

This Essay has been announced in another form, to contain some articles on the Blight in Corn Crops—on the Turnip Fly—the improvement and degeneracy of Animals—and on the Rot in Sheep, but the Author has been advised to put these subjects in a separate work, which will be pub-

lished in the course of twelve months from the first appearance of this ; and to which will be added, a Geological Inquiry into the Structure of Soils, and the Chemical Principles of Vegetation ; also a Treatise on Surveying, as far as may be applicable to Agriculture and Rural Economy.

*Frimley, Surrey,
Feb., 1838.*

DESCRIPTION

OF

THE STRATA AND SOILS IN THE GEOLOGICAL
MAP OF THE SOUTH EAST OF ENGLAND.

The last deposition made by the retiring waters from off the surface of England, must have been those alluvial deposits which form extensive tracts on the South Coast, known as the Romney Marshes and Pevensey Level, marked in the map with a triangle, thus Δ ; these as well as various vallies of a similar deposit on the banks of the several rivers have been fenced from the present flood tides, and form the mixed soils and rich vegetable remains of marshes and moors. The upper regular deposit on the surface, is the diluvial rounded gravel in various parts, the Suffolk crag, the fragmentary gravel, and the vegetable soil over the surface of all strata. The next deposit in the downward order is the extensive range of sand from Egham to near Farnham—Bagshot being near the centre of this sea of sand, it has obtained that appellation: a similar sand with fragments and round gravel is found also topping the clay hills, viz., in the Isle of Sheppey, Shooter's Hill, Hampstead Hill, &c. The next stratum is the London clay, forming the hills around and the substratum of the metropolis, also the principal soil of Middlesex and Essex; it also forms an edging to the circular extent of the Bagshot sand which rests on it. Below the clay we meet with a varied set of deposits, known to geologists as the plastic clay formation, consisting of sand, brickearth, mild clay, gravel and deep loamy soils, occupying the surface of nearly whole counties, as Norfolk, Suffolk, Herts, Berks, Wilts, and Hants, the North part

of Kent and Surrey, South of Sussex, and N.E. of Dorsetshire, as marked B. on the map.

The hops of Norfolk, Suffolk, Essex, and around Canterbury are raised in this soil, which rests immediately on the upper strata of chalk, which it will be observed by the map extends from N.W. of Norfolk to Dorsetshire; on the eastern side of Hampshire the chalk branches through Surrey in a ridge called the Hogs-back, and thence into Kent, terminating at Dover, called the North Downs; and from near Alton the chalk branches into Sussex, terminating at Beechly Head, called the South Downs. These distinct lines are the breaking out or denuding of the chalk to the surface, and exhibits bold escarpments; the principal range of hills offers a bold front to the North West; the North Downs show a face to the South, and the South Downs to the North. The dip of these ranges of chalk form two extensive hollows known to geologists as the London and the Isle of Wight chalk basons; within these rest the strata that have been described: the chalk consists of three distinct deposits.

From under the lower grey chalk a thin stratum of argillaceous marl issues, and occasions a valley between the chalk downs and the next descending formation, called the green sand; this yields a soft green sand stone in its upper, and a calcareous marble in its lower portions; the latter is known as the Kent ragstone, amongst the rubble of which and its admixed sand and clay the principal part of the Mid-Kent hops are grown, see D. D. on the map. The next stratum is the oak tree clay, so called from that wood abounding on it, and is known as the Weald of Kent and Sussex; where the clay approaches the green sand on one side, and the iron sand on the other, the soil is in the culture of hops: this clay is denoted by E.E. The next and deepest stratum pourtrayed in this map is the ferruginous or iron sand, forming in Kent and Sussex a nucleus for the other strata to rest on; the centre of this range of sand appears to have been uplifted by some convulsion of nature, for it dips from the centre to the North, with the super-

incumbent strata under the North Downs, and to the South under the South Downs: in this iron sand the principal hop growing places of Sussex are situated.

For further information on Geology see the hop districts, and for the secondary strata consult Phillips and Conybear's Geology of England, or Baxter's Library of Agricultural Knowledge, on Geology, by E. J. Lance.

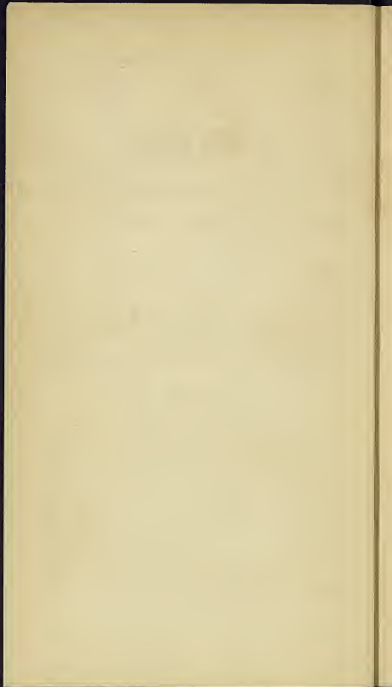
EXPLANATION OF THE COPPER PLATE

TO THE HOP FARMER.

The MALE and FEMALE HOP BLOOM shows the sexual distinction; the leaves are here drawn with the two varieties; the female is taken at the period when the first petals are beginning to be formed, having received the farina from the male. (*See Botany*).

HYDATID, FLUKE, OR FLOUNDER in the liver of sheep.—This appears on the plate, because it was originally intended to have given an essay on the diseases of animals in this work, but now it will appear in a separate work.

The HALTICA, TURNIP FLY, is a variety of the flea, or jumping bob, which appears on the hop leaves at their first coming out, and also in the blossom or hop. (*See the Flea in the Diseases of Hop*).



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Female Bloom of the Hop.



Male Bloom of the Hop.



Natural Size.

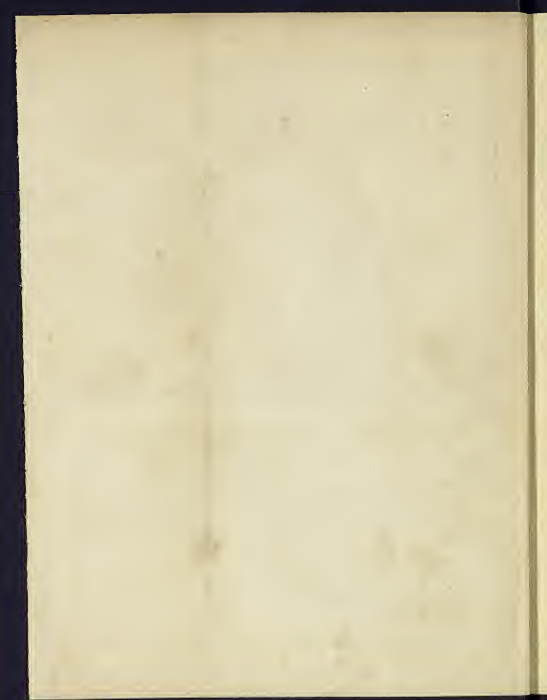
Hydatid or Flounder, generated in the Liver of Sheep.



Natural Size.



Haltica-nemorum or Juniper of the Woods.
Hump Fly.



GEOLOGICAL MAP
of the
SOUTH EAST PART
OF
ENGLAND.

For the "Golden Farmer"

E. I. LANCE. DEL.



ON THE CULTIVATION OF THE HOP.

Botanical terms of the plant according to Linnæus.

Class 22, DIÆCIA ; Order 5, PENTANDRIA ; Natural order, SCABRIDEÆ.

Names by which it is known in different Countries.

Humulus Lupulus, Latin ; Hopfen, Ger. ; Hoppe, Dut. ; Lupoli, Ital. ; Houblon, Fre. ; Luparo, Port. ; Chmel, Russ. ; Oblon, Span.

The Latin word *Lupinus*, means a bitter and harsh taste ; *Lupus*, is the Hop ; hence, we have, *Lupuline*, a tincture of Hops.

CHAP. I.

ANTIQUITY—HISTORY—AND LAWS.

It is said that the hop is not indigenous to England, but that it was brought to this country from Flanders, about the year 1525, and in 1528, the parliament was petitioned to forbid its use, as being a pernicious weed, that would spoil the taste of drink. But in truth the plant was known long previously to 1525, for it grew wild by the sides of hedges in many parts of England, and its young shoots were often gathered by poor people, and boiled as an esculent vegetable. The *culture* was introduced from the low countries in the time of Henry VIII. The generic name of the plant *humulus*, is formed from *humus* "fresh earth" and the specific name of the common hop, *lupulus*, from *lupus salutaris*, the name by which it was, according to Pliny, formerly called, because it grew among the willows, to which, by twining round and choking

up, it proved as destructive as a wolf to a flock. It is rather curious that an allusion to the wolf is also contained in the ancient British name of the plant, *llewig y blaidd* or "bane of the wolf." The current name *hop* seems to proceed from the Anglo-Saxon *hoppa*, to climb. Before this period, ground ivy was used for preserving beer. It was Henry the Eighth who forbade the use of hops, or of sulphur, in beer.

The first mention of hops in our statute books, is in the year 1552, 5th Edward the VI. cap. 5. By an act of parliament in the first year of James I. 1603, it appears that hops were *produced in England*, inasmuch that several statutes and regulations were made for the curing of them; and these regulations were under the inspection of the Excise officers; but they were *imported* in considerable quantities until the year 1693, about which period the culture became well established in Kent. In 1710, by an act of Queen Ann, a duty of 3*d.* per pound was laid on all hops imported, and heavy fines were inflicted in case of fraud. By the 7th of George the II. 1734, a duty of one penny per lb. was levied on all hops *grown in England*, and made fit for use, payable within six months after being cured and bagged; and hop grounds were required to be entered in the books of the excise under penalty of forty shillings per acre; places for curing and keeping were also to be entered, and all hops were to be brought to be cured, within six weeks after picking, under a penalty of five shillings in the pound.

Re-bagging foreign hops in British bagging for sale or exportation, incurs a forfeiture of 10*l.* per cwt.; and defrauding the revenue by using twice or oftener the same bag, with the officer's mark upon it, is liable to penalty of 40*l.* The removal of hops before they have been bagged and weighed, incurs a penalty of 50*l.*; concealment of hops, subjects the concealer to the forfeiture of 20*l.*, and the concealed hops; and any person who shall privately convey away any hops, with the like intent to defraud, shall forfeit five shillings per pound.

No common brewer shall use any bitter ingredient instead of hops on pain of paying 20*l.* Hops which have paid the duty may be exported to Ireland, and by the act of George II. no *foreign* hops shall be landed in Ireland.

Notice of bagging and weighing must be sent in writing to the exciseman, on penalty of 50*l.*; and by an act the 14th of George III. cap. 68, the officer shall on penalty of 5*l.*, weigh the bags or pockets,—mark on each, the true weight or tare,—the planter's name and place of abode, and the year in which such hops were grown. The altering, or forging, or obliterating such marks incurs a penalty of 10*l.* The owners of hops shall keep at their cost, just weights and scales, and permit the officer to use them on penalty of 20*l.*; and by the 10th of George III. cap. 44. a penalty of 100*l.* is inflicted for false weights and scales. The owners of hops are allowed to use casks instead of bags, under the same regulations.

On or before the first of August in every year, notice must be given to the excise, by all hop planters, of the kilns and store rooms—where situated—and the number of oasts or holes; the doors of the kilns to be marked with a letter, and the store rooms to be also marked, A. B. C. &c.; the oasts must also be numbered, and an entry made of the number of acres in cultivation. Before bagging, forty-eight hours' notice must be given to the excise, and for weighing twenty-four hours notice is required.

If any person shall mix with hops, any drug, so as to alter the natural colour, or scent, he shall forfeit 5*l.* per cwt. *Lord Kenyon convicted a person in this penalty in the 35th year of George III.* By the act 6th George II. cap. 37.—If any person shall unlawfully and maliciously cut hop bines growing on poles in any plantation, he shall be deemed guilty of felony, without benefit of clergy.

It would appear that hops were originally cultivated by, and considered as the work of a gardener, by the grounds retaining the name of garden, although con-

sisting of 100 acres ; but in the North Clay district, the grounds are termed yards.

THE DUTY.

The hop duties at present are payable in March and October of the year following the produce. Various regulations have been enacted, relative to the periods of payment, particularly from the year 1819 to 1822, during which period the payments were postponed to September and November following, but the hops unsold were to be placed as security for such payments under the lock of the excise as well as that of the owners, and personal security given. It should be allowed to pay the duty, whenever, previous to the period assigned, the grower finds it convenient to do so, that is when he has sold his hops. The growths of Hampshire and of Farnham are generally sold at Weyhill fair in October, and at that period many of the growers would like to pay, being allowed a discount for the anticipation.

The duty on the home produce is now *2d.* per lb., with a drawback of the like sum on exportation, and the excise regulations allow 1lb. in every 10lb. for waste and bag. This duty of *2d.* will be more easily understood by the following statement of the duty paid for the growth of the year 1835.

Up to 1801 the old duty 1 <i>d.</i> and $\frac{1}{2}$ of a farthing per lb.....	} = <i>2d.</i>	..... 235,207	2	11 $\frac{1}{4}$ $\frac{1}{10}$
In 1802 an additional duty of 1 <i>s.</i> 7 <i>d.</i> per cwt. nearly, reduced in 1805 by 4 <i>s.</i> 8 <i>d.</i> per cwt. leaving $\frac{1}{4}$ and $\frac{3}{10}$ of a farthing.....				
		..... 173,848	15	S $\frac{6}{10}$
		409,055	18	3

The duty payable on the importation of hops is at present 8*l.* 10*s.* per cwt.

<i>The following were the amounts of the Duties on Hops at the periods specified, viz. :—</i>			
in 1711..	£ 43,437	in 1778..	£ 159,801
1725..	6,526	1782..	14,895
1754..	112,000	1794..	205,663
1760..	117,992	1801..	241,227
1764..	17,178		

At the commencement of these periods the importation duty was 3*d.* per lb.

The following tables, as well as those at the end of the work, are given for the service of those growers and other gentlemen, who speculate or sport on the amount of duty, before that duty is known.

Table showing the amount of duty paid in the several years, dropping the odd Shillings and Pence.

	£.	£.	£.	Acres
				in
				culture.
1802 old duty	15,463	new duty	18,152 total	33,616
1803	199,205	.....	233,849	433,054
1804	177,617	.....	208,507	386,124
1805 reduced	32,904	.....	24,254	57,158
1806	153,102	.....	113,162	266,265
1807	100,071	.....	73,966	174,037
1808	251,089	.....	186,607	437,697
1809	63,952	.....	47,269	111,222
1810	73,514	.....	54,336	127,851
1811	107,085	.....	116,107	223,192
1812	30,561	.....	22,589	53,151
1813	131,482	.....	97,182	228,665
1814	140,292	.....	103,644	243,936
1815	123,878	.....	91,562	215,441
1816	46,302	.....	34,223	80,526
1817	66,522	.....	49,168	115,690
1818	199,465	.....	147,431	346,896
1819	242,076	.....	178,925	421,101
1820	138,530	.....	102,244	240,774
1821	154,609	.....	114,276	268,886
1822	203,724	.....	150,579	354,203
1823	26,057	.....	19,259	45,317
1824	148,832	.....	110,006	258,838
1825	24,317	.....	17,973	42,290
1826	269,331	.....	199,070	468,401
1827	140,848	.....	104,105	244,953
1828	172,027	.....	127,150	299,178
1829	38,398	.....	28,381	66,780
1830	88,047	.....	65,078	153,125
1831	174,864	.....	129,247	304,112
1832	139,018	.....	102,752	241,770
1833	156,905	.....	115,973	272,878
1834	189,713	.....	140,223	329,936
1835	235,207	.....	173,848	409,055

The expence of collecting the duty in the year

1829 was 2,275*l.*

in 1833 ... 3,316*l.*

in 1834 ... 3,432*l.*

and in 1835 ... 3,675*l.*

The whole growth of England in 1833 was 292,369 cwts. Exported from Great Britain in the year 1834, (the growth of various years from 1817 to 1834), 870,999lbs.; and the quantity imported from foreign countries during the same year was 52,699lbs.

An Account of the Duty on Hops the Growth of the three following years of the principal Hop Districts, (the gross duty is here given without the decimal parts of a pound) to show the varied amount of the different growths; also the weight grown in each district for the three years:—

	1833.		1834.		1835.	
	Duty. £.	Growth. Cwt.	Duty. £.	Growth. Cwt.	Duty. £.	Growth. Cwt.
Canterbury.	57,144	61,225	67,086	71,878	98,975	106,045
Essex	1,369	1,466	1,773	1,899	2,131	2,283
Hants, with Farnham.	5,820	6,235	9,876	10,581	4,386	4,699
Hereford ..	24,160	25,885	19,594	20,993	22,734	24,357
Lincoln ...	1,626	1,742	4,945	5,298	350	375
Rochester..	90,599	97,070	108,468	116,215	144,681	155,015
Salisbury ..	3,302	3,538	4,945	5,298	2,464	2,640
Stourbridge.	1,543	1,653	1,319	1,414	1,083	1,161
Sussex	80,794	86,565	102,942	110,295	127,458	136,562
Worcester ..	5,122	5,488	4,551	4,876	3,480	3,727

The district of Worcester paid in the year 1823 only 4*l.* 3*s.* duty, and in the year 1826 the same district paid 30,649*l.* Kent in 1823 paid 14,677*l.*; in 1826 the amount was 151,539*l.* Farnham in 1823 paid 667*l.*; in 1826 14,650*l.*; there we have a comparison of a failing year, with a superabundant supply, and showing the great casualty of the crop. The year 1823 was a general failure throughout the country, as the year 1826 was a most abundant one; but in the year 1825, which was a failing year, Worcester paid 11,911*l.* duty; and Farnham paid 1,289*l.*, whilst all Kent paid but 7,631*l.*

The gentlemen who anticipate the amount of duty whilst the crop is growing, and make wagers on what that amount will be, may find some assistance from the following table; for by knowing the average growth of a considerable surface of plantation, some knowledge of the gross amount may be formed. For instance, the average growth of Rochester or Canter-

bury collection, would form this estimate very near the truth, as they pay so considerable a part of the hop duty,—more than half the collection.

As this sporting, or more properly gambling, on the forthcoming amount, is always made on the old duty of 10s. 8d. per cwt., this table is calculated on that payment, and the number of acres in culture taken, as the return of 1834, at 51,273. The number of acres in culture in the year 1807 was only 38,218; in 1833, the number was 47,101 acres; but now, there appears to be, (that is in year 1834) 13,055 acres of hop-ground more in culture, than there were 27 years ago. In 1835, the number is stated to be 53,816 acres.

A Table of the Amount of Duty payable when the average of the whole country is equal to the following estimations per acre, calculated from the number of acres of ground, under the culture of Hops, in 1834, being 51,273, and the old duty being 10s. 8d. per Cwt.

When the average growth per Acre amounts to.....	Cwt. Qrs. 0 2		The duty will amount to...	£.	s.
do.	1	0	do.	13,672	16
..	1	2	..	27,345	12
..	2	0	..	41,018	8
..	2	2	..	54,691	4
..	3	0	..	68,364	0
..	3	2	..	82,036	16
..	4	0	..	95,709	12
..	4	2	..	109,382	8
..	5	0	..	123,055	4
..	5	2	..	136,728	0
..	6	0	..	150,400	16
..	6	2	..	164,073	12
..	7	0	..	177,746	8
..	7	2	..	191,419	4
..	8	0	..	205,092	0
..	8	2	..	218,764	16
..	9	0	..	232,437	12
..	9	2	..	246,110	8
..	10	0	..	259,783	4
..	10	2	..	273,456	0
..	11	0	..	287,128	16
..	11	2	..	300,801	12
..	12	0	..	314,474	8
..			..	328,147	4

The above table progresses at 56lb. per acre, but should a calculation be required midway, between the increased averages per acre, the amount of duty will be the half of the difference between the two sums. No allowance has been made in this calculation for any tare on the produce per acre, although it is probable that a tenth or twelfth of the growth is either wasted in dust, the sweepings of seed, (which commonly is thought little of) or in allowance for tare of package.

Those gentlemen who venture great sums on a speculation of the current duty, from having seen only a small portion of the growth of this Island, will do well to consult the above table, and those of the hop duty returns given at the end of this work.

The old duty of 10*s.* 8*d.* paid in 1835 was 235,207*l.*, this was more than an average of 8½ cwt per acre, (according to the above table,) and on the whole duty of 2*d.* per lb., being 409,055*l.*, it occasioned a direct tax on the hop grounds of 7*l.* 19*s.* 6½*d.* per acre. A pretty tax this on an acre of land—a fine contribution to the exigences of the state—far above even the average rent-charge of all the hop-land in England.

The excise regulations to be attended to, are; that notice must be sent to the officer of excise in the neighbourhood, before the month of August, of what quantity of ground is in culture, where situated, and the place at which it is intended to dry the same.

It is also ordered by law, that a bag of hops shall consist of five yards of cloth, from 42 to 45 inches in width, and must when filled, weigh 2½ cwt., and that not more than 11lb. of cloth shall be used for 10 lbs. of hops. At Farnham, bags or pockets are made to contain about 2½ cwt. of hops, with 5¼lb of cloth, being 5¼ square yards; the price is one shilling per yard or per lb., as made by Mr. John Ledbitter.

This quantity of cloth is much under what is allowed by law, and much under the weight of cloth

used in packing Kent hops, and hence one of the causes of the superior price of the Farnham hops; other causes will be explained in the course of this essay.

The speculations on the duty, and the spirit of gambling which it inculcates, and which is so prevalent amongst the growers, dealers, and others, in the neighbourhood of hops, is by some considered to have an injurious effect, and appears to be the most dangerous attendant on hop growing, in nowise according with the sober meetings and habits of British farmers, who are in general industrious thoughtful husbandmen.

MEDICINAL QUALITIES AND USES OF THE HOP.

In the front of this inquiry we must place the application of *hop* to the service it performs in the keeping of *malt liquor*, for it is a question, not yet satisfactorily decided, whether so employed it adds any spirituous strength. But this question is not now our province to discuss; the aromatic bitter has been proved by experience to give malt drink, a more pleasant flavour, and to keep it in condition longer than any other ingredient,—and it may be observed that an eminent chemist, who publishes a quantity of miscellaneous receipts, among which one for extracting the virtues of hops in brewing says, the richer and better the wort is, the *less* it will partake of the essence of the hops. The rich fat wort sheathes up the pores of the hops, and as it were, embalms the leaves, so that the ale wort can extract scarcely any part of the necessary quality of the hop; but when it is put into the small beer wort, a fluid of a thinner nature, there the pores are unsheathed, and the small beer is rendered too bitter; therefore before used for a strong drink, the hops should be soaked in a pail of hot water. To confirm this he instances, that one $\frac{1}{4}$ oz. green tea will not yield the same flavour with water sweetened with the same quantity of sugar that would be necessary to sweeten it afterwards, that it

would if immersed in simple water. A writer in the Edinburgh Encyclopædia says, "If alcohol in which the hop has been digested some days be previously freed from the undissolved matter and then distilled in a retort, there remains behind a solid green coloured oil; to this the hops owe their peculiar smell. Its taste is peculiar, sharp and scarcely bitter, but putting one in mind of the flavour of good ale, and is the part of the hop which gives ale its distinguishing flavour. Hence when hops are too long in wort, the aromatic odour and peculiar flavour are nearly dissipated and a bitter taste substituted. It is the opinion of brewers that the intoxicating qualities of ale are to be partly ascribed to the oil of the hop: indeed it has been pretty common to ascribe intoxicating qualities to bitter tasted substances in general. Thus a woman of the name of Johnstone, who kept a public house a little to the Southside of the meadows near Edinburgh, about the beginning of the last century, was famous for brewing a pleasant and very intoxicating ale, and the last quality was universally ascribed to the broom tops which she employed as a bitter instead of hops. But this opinion, though very general, does not appear to be founded on any precise observation. We are not acquainted with any volatile oil that produces intoxication; though some, as turpentine, act with great energy on the stomach. No infusion of any bitter whatever is known to produce intoxication; two ounces of peruvian bark per day has produced no such effect swallowed in substance. Beside this volatile oil, hops contain likewise a bitter principle, which may be easily extracted by water. As far as we are able to determine the point, this bitter matter possesses the character of the bitter principle in perfection. No re-agent that we tried is capable of throwing it down, except acetate of lead, a somewhat ambiguous precipitant, because it throws down the greater number of vegetable substances, and because the lead in this salt is partially thrown down by carbonic acid, if present in the solution. Nitrate

of silver is likewise a precipitant throwing down the bitter principle of hops in light yellow flocks, but it is also ambiguous for the same reason that renders acetate of lead so. The bitter principle of hops is likewise very soluble both in water and alcohol."

The newer the *hops* are, the better the bitter always proves to be, their fragrance and flavour being in some degree lost by keeping; the aromatic oil is exceedingly volatile, and when impregnated with much sulphur it is still more so; nothing can prevent the passing away of the strength, and the weight also, except it may be in close barrels, or other air tight vessels. The quantity of hops used to a *bushel of malt*, must be regulated by the palate of the drinker, and the time the beer is intended to be kept. One pound of hops to a bushel of malt may be considered as the average quantity.

There can be but little inducement for a man of judgment to use any substitute for hops, as it must be plain to every one, that when a trade is to be gained and preserved by pleasing the palates of the customers of brewers, that no article can communicate so fine a flavour to beer as choice hops, and well made malt; and when beer is made with these ingredients, and properly fermented, it may be removed without thickening it; but it is advisable that some loose hops be put into the cask, to collect the light yeasty particles and compel them to subside.

The strength, and consequently the value of hops, has been ascertained, by a delicate operation, in gauging a decoction with an hydrometer; given weights of different hops, have been boiled in certain quantities of water, the plain water, and the different extracts, are then gauged at the same degree of temperature, with an hydrometer, and the density will be found to increase from 50 to 100 above that of the water. The experiment has been tried with a thermometer when the liquor was in a boiling state, but it did not answer so well as with the hydrometer. Distilled water would be the best for the experiment, and

the density of the water, must be accurately taken before the trial ; the quantities of hops must be exact, as well as the water ; and evaporation in boiling, must also be prevented as much as possible.

The author has made extracts from the stalk of the blossom, (strombile) from the petals only, from the seeds, and from the young shoots and leaves ; all were very evident to the taste, and it could easily be decided which was the best for bittering malt drink. The liquor in which the stalk was boiled, after keeping it twelve months, retained a fine brown colour, and a mild bitter taste.

Ale and beer were formerly known as two distinct beverages, the former having hops in it, and the latter having been made without them. In boiling hops with the wort it is of much consequence that the copper be covered, or enclosed in a proper manner, to retain all the essential oil.

As to the quality of the hops much resides in the seed, the cause of which will be explained under the head *Botany of the Plant* ; but the remarks of the experienced brewers, may now be made. It is an ascertained fact that when the hop is strong, *having a pungent bitter*, much seed is found in the hop-back, and a dark slime settles on the surface of the hops, when the beer is run off ; and this sort of hop, is preferred by all strong brown beer, or porter brewers, who are not particular about the light colour of their beer ; —should the hops be weak in the bitter quality they settle in the hop-back in a hovering state, are light on the surface, and without slime ; the porter-brewers, and brewers of brown stout, therefore purchase the discoloured hops in bags from Kent as being the strongest, having hung the longest on the bine, the seed being more full, and containing the completion of nature's design, viz. the germ of a future plant.

The brown beer brewers, are known to prefer the growth of certain planters, in consequence of their growth containing much seed ; and several persons in Kent could be named, who cultivate hops in a sys-

tematical manner, according to nature, having many male plants in their grounds, and the produce of these planters, is most preferred by the above named brewers.

The flavour which is given by hops to beer is inimitable, and unattainable by any substitute whatever; any attempt at an imitation by brewers, is generally attended by a decreased demand, for the beer in which it is used. Some persons can easily distinguish between the fine flavour which accompanies the bitter of the hop, and those ingredients which are said to be used as substitutes; but it is not only the peculiarly fine flavour, which the hop gives to beer, there is also its preservative qualities which makes it so essential to the brewers. To obtain a knowledge of the peculiar flavour of hop, it is best to bite a seed that has been properly grown in the neighbourhood of the male plant, and its pungency will be most evident.

It does not appear that any alcohol is obtained from hops, they act only as a preservative and flavourer of beer, and without this article, at some seasons, an acidity would take place in the first stage of fermentation. This is well known to the makers of vinegar from malt, for with them the introduction of hops, at a certain stage of their process, would convert their article into beer instead of vinegar.

Stronger and more pungent bitters may be purchased, than hops, such as gentian and quassia, but they want the preservative property, they are useful articles as medicines, but in beer they are most injurious to the saccharine matter of the malt, being devoid of the aromatic flavour, and preservative qualities, hence beer bittered with these ingredients, must be used quickly, or they would be detected; and hence the impropriety of giving encouragement to the drinking of new or mild beer.

The pale and early picked hops, (when the seed is not completed, and when the principal bitter, resides in the base of the leaf, and in the dust or juice which

is placed about the seed, called by the growers "the condition") are used for flavouring pale ales, particularly when colour is of much consequence, and this object is a great desideratum with the Farnham growers; hence the great demand for this fine article in the West of England, where pale ale is so famous. When the colour can be depended upon as natural, the hop obtains the best price, as is evidenced by the Farnham prices of hops. (On this head see the chemistry of drying.)

The bine and leaves of hops have lately been used for tanning light skins, instead of oak bark, and a patent has been taken out for the process, by Mr. J. P. Newman, 151, Fenchurch-street. The bines therefore contain the *gallic acid*, and the astringent principle; they contain also, the *muriate of potash*, which alkali is contained in all soils, and would be a good manure for hop grounds.

The hop is found to contain a great proportion of oil in a fixed state, from which a tincture and an extract are prepared. Another tincture is made from the dust, which principally arises from the female juice, ("condition" as it is called), this is much used in medicine, and is known as HUMULI or LUPULINE, from its Latin terms, it is used as a tonic and a diuretic medicine. As a narcotic its powers are known in beer, and have been often used to produce sleep from the smell only; a pillow stuffed with them is said to have given repose to George the III. when other opiates failed.

In a productive year any means of using up the hops will be of service to the growers, it is therefore recommended to be smoked instead of tobacco, or it may be mixed therewith; it is grateful to the taste and smell, and moreover will cure rheumatic pains by using in this way; the mixture is sold at Farnham as Harding's Lupuline; it is also superior to stramonium for asthmatic complaints.

All tinctures and extracts, or other solutions, should be made from the new hops, that have not been fumi-

gated with sulphur, or they would become sulphate of hops. Old hops are known to the brewers not to yield so much bitter as the new ones, and this is the case with all flowers, the fragrance lasts only for a time. (*See keeping of hops.*)

Medical works, in treating of the hop, describe it as *Humulus Lupulus*, *Diæcia Pentandria*. Linn. The strombiles are dried, and are intensely bitter, aromatic, and astringent. By simple infusion, the aroma is extracted; by short boiling the bitter, and by long continued boiling the aroma is dissipated, (if in an open vessel) and the astringency predominates. The aroma resides in a volatile oil, and the astringency in a species of tannin, as sulphate of iron is blackened by it. Its evident effects are to impart an aromatic bitter, and to retard the acetous fermentation, for malt liquors keep longer in proportion to the quantity of hops added, and the bitterness decreases as the liquor becomes ripe, disappearing when it verges to acidity. Administered as a powder the dose is about three grains, although it may be remarked that it is difficult to pulverize, it produced sleep in many experiments of Dr. De R ——. The tincture seemed to have the same effect as the mixtures, but it was not so uniform in its action. Some medical men give it in the form of tincture and extract, with the best effects, in some cases of rheumatism. It does not appear, that it has any influence in relaxing the bowels, but on the contrary; and that the pulse is reduced in frequency, and increased in firmness by the use of this medicine in a very direct manner.

Sir H. Davy, in his Agricultural Chemistry, says, "The bitter principle is very extensively diffused in the vegetable kingdom; it is found abundantly in the hop, (*Humulus lupulus*), in the common broom (*Spartium scoparium*), in the chamomile (*Anthemis nobilis*), and in *quassia*, *amara*, and *excelsa*. It is obtained from those substances by the action of water or alcohol, and evaporation; is usually of pale yellow colour, and its taste is intensely bitter. It is very

soluble both in water and alcohol, and has little or no action on alkaline, acid, saline, or metallic solutions."

"The natural bitter principle is of great importance in the art of brewing; it checks fermentation, and preserves fermented liquors; it is likewise used in medicine.

The bitter principle, like the narcotic principle, appears to consist principally of carbon, hydrogen, and oxygen, with a little azote.

The bitter may be extracted by infusing the hops for some time in cold water."

Doctor Thompson enumerates the characters of this substance as follows:—

"1st. When water thus impregnated is evaporated to dryness, by a very gentle heat, it leaves a brownish yellow substance, which retains a certain degree of transparency; for some time it continues ductile, but at last becomes brittle; its taste is intensely bitter.

2nd. When heated it softens, swells and blackens, then burns away with flaming much, and leaves a small quantity of ashes.

3rd. It is very soluble in water, and in alcohol.

4th. It does not affect blue vegetable colours.

5th. It is not precipitated by the watery solution of lime, barytis, or strontites, nor is it changed by alkalies.

6th. Tincture of galls, infusion of nut galls, and gallic acid produce no effect.

7th. Of the metallic salts, nitrate of silver, and acetate of lead are the only ones that throw it down.

The precipitate by acetate of lead is very abundant, and that salt therefore affords the best test for discovering the bitter principle when no other substances are present, by which also it is decomposed. From recent experiments of Mr. Hatchett, it appears that the bitter principle is formed along with tan by the action of nitric acid on indigo."

A decoction of hops, diluted with water, and given

to cattle in very severe weather, is said to be of great service, and remarkably to improve their strength.

In Sweden, the stalks of hops are successfully converted into strong cloth, for which purpose they are gathered in autumn, soaked in water during the winter, and in the succeeding spring, after being dried in stoves, they are dressed like flax. This object has been attempted in England, in consequence of the premium offered by the Patriotic Society for the Encouragement of Arts, Adelphi, London, a detail of which, and also the premiums, may be seen at the Society's Rooms by personal application.

The hop bine will afford a material for spinning yarn, which may be woven into sacking, as well as coarse bags for hops. The bines may also be used as binders for sheaves of corn or beans haulm, and a coarse brown paper has been made out of them at a mill in the neighbourhood of Maidstone. It is usual for the workmen who cut the superfluous bines to stack them, and in the winter they form a good food for cows or horses; the bines require careful harvesting to preserve them.

From the young leaves and off-shoots of the bine, after being dried, an extract is obtained, which will dye woollens of a fine cinnamon brown, the articles being previously dipped in a diluted solution of bismuth: the expressed juice of the bine is well known amongst French chemists as affording a permanent red brown colour; they also make decoctions, and syrups of hop flowers for service in pestilential fevers, and for the scurvy and other cutaneous disorders.

In Flanders, where the hop is cultivated, the principal culture being from Brussels to Alost, they use the young shoots in the same way we do asparagus, tied in bunches, boiled and stewed, eaten with butter or gravy; these young shoots or buds are continued cutting for five or six weeks of the spring; some principal bines are allowed to run up the poles, and as fast as the buds appear above ground, three inches

long, they are cut off, thus throwing greater vigour into the trained bine. The bunches are sold in every vegetable market of that district.

In a green state the hop bine is relished by most cattle, and in some situations they have been much injured by the bite of hares and rabbits.

When there is a greater quantity of hops grown for several years than are likely to be used whilst they are good, it would be well to devise a plan for consuming them in those over-stocked years. For the use of bittering beer, an extract may be made, and all the fine qualities of the hop retained in a liquid state ; or the bittering principle concentrated in a dry state of powder, and thus preserved may be sent on board ship for exportation, or conveyed to any part of England in air tight vessels : this would be the means of saving much room on ship board or in warehousing a stock. The quality of bark for medicinal purposes, is now concentrated into a small compass as *Quinine* ; and why not the bitter principle of hops ? Instead of one pound of hops to a bushel of malt, part of an ounce of extract would then be sufficient, particularly if the extract was made with spirits of wine. A tincture of hops may be made with part water and part spirits of wine, and subjected to a gentle heat for a few days in an air-tight vessel : the full virtue of the hop will be thus extracted, and the virtue of several hundred weight be concentrated in a gallon of liquor ; this would be the tincture of lupuline, and would act as a medicine, or might be used for flavouring beer. The seeds and dust from which the lupuline is made have been found equal to ten times the weight of hop petals, and this woody fibre of the bine to contain fifty-two parts carbon, forty-three oxygen, five hydrogen ; the bine also contains the gallic acid and potass. The gallic acid may be tasted in the bitterness of the bine, the same as the pure tannin may be tasted in the seeds of a grape.

CHAP. II.

GEOLOGICAL OBSERVATIONS ON THE SOILS
IN WHICH THE HOP PLANTS ARE CUL-
TIVATED, AND AN EXAMINATION INTO
THE MINERAL, VEGETABLE, AND ANI-
MAL MANURES USED IN VARIOUS SOILS
TO INVIGORATE THEIR GROWTH.A CURSORY SURVEY OF THE HOP CULTIVATION IN
ENGLAND.

The object of these remarks, is to give a rapid view of those parts where the hop is cultivated ; and as introductory to a more particular geological inquiry.

If a foreigner was to land at the Isle of Thanet to view the agriculture of the S.E. part of England, and to take the following rout he would give a very different account to one we will trace through another part of the country. Of the first, we would take him from the Isle of Thanet, up the Stour river to Canterbury, following the course of that river over the tenacious alluvial loams resting on the chalk formation, through the gorge of the chalk escarpment to Ashford, across the Green Sand, and Kent rock stone hills, to Tenterden, Smarden, Cranbrook, Hawkhurst, and to Tonbridge on the Clayey and Iron Sand Weald ; viewing the Ragstone Hills to Maidstone, Malling, Wrotham, Sevenoaks, and Westerham, having "*the winding vale of Homes dale*" to the north, (being the site of the Gault clay,) thence passing into Surrey near Oxtead, to Ryegate, Dorking, Guildford, and to Farnham, taking the course of the Wye to Alton in Hampshire ; then to Petersfield, and Portsmouth. This person would leave the country impressed with the idea that every part abounded in *hop* and fruit enclosures ; with corn and fertility of the most enlivening kind, particularly if the journey

is made in the month of July or August; cultivation would be found carried to the top of the sandy stone shattery hills to the foot of the chalk hills, and in the tenacious clay vallies on each side of the silicious elevations. This traveller would call the country rich beyond any measure to be found on the Continent of Europe, having some land which would let for 20*l.* per acre per annum, the valleys abounding in valuable timber, the inhabitants well employed, and enjoying the blessings of peace and plenty, in the midst of garden farms; and thus exceeding in beauty and abundance the gay vineyards of the south.

The other traveller, we will suppose to land at Dover, passing over Barham chalk Downs, and following the course of the North Downs, in Kent, a very few miles north of the line we have before traced, passing into Surrey on the chalk Downs, near Warmingham, taking the direction of the Downs, and on to the Bagshot sand district near Woking, passing into Hampshire two miles north of Farnham; at Aldershot, keeping on the chalk Downs to Basingstoke, over Salisbury Plain, and thence through the new forest to Lymington on the coast.

This person would describe the aspect of the country as nearly a barren waste, fit only for rearing sheep on the chalk downs, and supplying fuel from the furze and heathy sand surfaces of the middle parts of Surrey and Hampshire; the little timber growing thereon being characteristic of a poor single mineral soil; the districts being but thinly inhabited; and the villages far distant from one another, would give to a stranger a very bad opinion of the riches of English agriculture, and the resources of the country, and these views would be the effect of a superficial examination of the south-eastern part of England, the parties not taking into their estimation the geological arrangement of the earth.

The opinions and views which have been traced, so much at variance with one another, will have arisen, in a great measure, from the different mineralogical

structures, and the geological situation of the super, and subsoils, although the two travellers will have passed through the country a very few miles from one another.

Of the Hereford and Worcester district two similar routs may be traced as dissimilar in agricultural fertility; arising from the superiority of the red calcareous marl around Leominster, Bromyard, and Upton, to the Quartzose sand, Mountain Limestone, and Lias, on the east of those hop growing places.

A reference to the geological map would show the range which has been traced through the south-eastern parts of England, the hop being principally cultivated between the two great chalk basins of London and the Isle of Wight.

In this inquiry we have to consider the nature of the root, and the sort of soil in which it best ramifies itself, and obtains its nourishment. The natural form of the root is only seen when the plant has been raised from seed, a description of which will be found under the botanical division of our subject; the swelling of the tubers, and the lateral shoots of the rootlets go on best when the soil is open and has been well tilled to a good depth: although it will be seen that the hop is grown in almost every sort of soil, yet it only succeeds in full perfection where there is a clayey or calcareous loam, or open marly subsoil.

Of the nature of soils the principal ones are, sand, clay, and chalk, or the admixture of them, with some minor minerals, consisting of *metals* and *earths*; the three earths above named are considered to constitute nine-tenths of the surface, and are the *debris* of older or primitive rocks and strata. Most soils are mixed up with vegetable and animal matter, and all have potash in them, which is one of the bases of vegetables; but there are some surfaces which are nearly all composed of decayed vegetables (potash and carbon), as mosses and peat moors, and in these the hop plant is cultivated, (as Burling Moors, Kent), although there is but little mineral matter in them.

The definition of soils is first to be understood before a geological survey of the counties in which the hop is cultivated can be made with propriety; therefore, in speaking of *marls*, it must be borne in mind that they are of two kinds, according to the predominance of the particular earth which constitutes them; a clay, or a chalk (*carbonate of lime*), being the principal earths composing marls; clay loam, or sandy loam, according to the admixture of sand or clay; a hazel mould, or alluvial soil, according to the quantity of sand, clay, or chalk, or the decayed vegetation that may be in the soil; and the colour must be either the oxide of iron, or of some other metal, but it is always found that iron is the principal colouring matter of the earth's surface, unless it may be when carbon, or decayed vegetation, forms a prominent part; but in Ireland the very bogs are found to yield masses of iron in a metallic state.

It has been observed, that where there is not a calcareous base, a hop ground does not last more than ten or twelve years, whereas, if the contrary, it will last for a hundred years, if the plants are healthy.

In the weald of Kent and Sussex, a crop of hops is taken as a course of husbandry, as a change for the land, it not being found to last as a permanent crop; and here the principal objection to the culture is that it takes the attention off from other parts of the farm.

ROCHESTER DISTRICT.

In taking a survey of England, to notice those places where the *hop* is cultivated, it will be well to place those districts first which yield the greatest quantity; and, as in the year 1833, the excise payment for Rochester was the highest, being 90,599*l.*, we will inquire into the nature of the soil from which so great a return was obtained.

This district includes Maidstone and its neighbourhood, which may be considered as the great mart of hope for that part of Kent, and extends to each side

of the River Medway (the garden of Kent) up to Tunbridge; the principal parishes in that district for affording the hop being Malling, Barming, Tarleigh, Nettlestead, Yalding, and, *westward*, to Mereworth, Peckham, Wrotham, Ightham, Seven Oaks; *eastward*, of the Medway, the district includes the three Charts, the two Suttons, Loose, Harrietsham, &c., and in all 137 parishes, containing 12,442 acres in the year 1831; the same sort of rag stone soil on which the hop is cultivated extends also near to Hythe on the coast, but belongs to the Canterbury collection.

In describing the districts, it will be found that the geographical and geological localities of the parishes have been studied, rather than the excise districts as taken by the collector of the duties; a more correct list of the parishes in each collection is given at the end of the work. The reader will, therefore, perceive, that it is the line of strata ordained by nature that has been described, rather than the divisions made by man, for the purpose of a money collection; for instance in the Hants collection, Alton, Bentley, Binstead, Froyle, Selbourne, are described in the geological account as belonging to the marl of *Hants*, in which county they really are; but the excise collection brings them into the Salisbury district. This, it is hoped, will be a sufficient excuse and explanation for any discrepancy that may appear in naming the places in a district, and which will be quite corrected by referring to the list of districts and their parishes, where the number of acres in each parish is correctly given, agreeable to the returns made to the excise, and published by order of Parliament.

Throughout the line thus traced, the soil consists of a loose calcareous sand, with interspersions of clay, and a stratified lime-stone, locally called the *Kent rag stone*: but the stone is much varied in its nature, passing from a green sand stone to a close calcareous marble. In the loose nodules or debris of this stone, the hop ramifies its roots and obtains its food of moisture, extending in some instances eight feet deep,

and when the soil is open even ten feet. The district now under consideration forms a surface rising ground of loose sand, and faces the escarpment or sloping bank of the Kent chalk Downs; between the chalk and this sandy ridge there is a clay vale, known as the Holmes-dale of Kent,

("The winding vale of Holmes-dale,
Was never won nor ever shall,")

the subsoil of which is a blue clay marl, (known as the Golt marl by geologists,) issuing out from under the chalk, and is not more than half a mile wide. In calling attention to the geological structure of the soil, of this and other districts, it must be understood that it is the general structure of the subsoil that is meant to be described, and that the varied nature of the supersoil in different places, will have arisen from vallies having a greater or less deposit from the washings of the elevated grounds around, but the surface soil will more generally partake of the nature of the subsoil.

There is a spot between Town Malling and Stroud, where the hop is cultivated in a Peat Bog, having drains at every rod wide; it is called the Birling Moors, consisting of low land, much under the high watermark of the Medway, which is kept from it by embankments; the peat is four and six feet deep in places, and when by accident or otherwise the land has a fire on the surface it has been known to burn for several months. On such land a mineral manure is required, yet in this soil, when the season is propitious, a good crop of hops is grown. Close to Rochester there are but very few hops grown, for the subsoil is chalk, therefore it is only in very favoured spots, a deep supersoil, that they will succeed.

The landlord of the Bull's Head at Stroud, (the adjoining town to Rochester) has some very fine hops in his garden, raised from seed which he accidentally threw out of the house with a bunch of hops that had been hanging; these yielded him fruit the third year after the seed had been sown, and he that year picked

3lb. of dried hops from one root; he has them now trained over all his back buildings, and the cuttings from these seedling hills grow in a vigorous manner wherever they are planted.

The farmers are often prompted to the planting of hops from the facility of obtaining the poles, and its affording a source of employment when the corn harvest is over, although the soil may not be the most suitable; moreover the hop produce affords some ready money, directly after the harvest, as most hop fairs take place in the month of October.

CANTERBURY DISTRICT.

Leaving that part, which is called West or Middle Kent, and taking a view of the culture in the Eastern part, we may with propriety commence our remarks with Canterbury, which paid a duty in the year 1833 of 57,144*l*. It is immediately around Canterbury and on the banks of the Stour River, extending to Chart and Charing on the West, and to Sellinge near Hythe on the East, that the principal part of this excise return is obtained, although it will be seen that the collection extends into the weald of Kent, to Smarden on the oak tree clay, or blue marl strata, and to Cranbrook and Hawkhurst, situated on the iron sand-stone formation.

The soil in the neighbourhood of Canterbury is very different to what we have been tracing through the middle of the county from Westerham to Hythe, for it is a sandy loam resting on a subsoil of chalk; though this loam is very deep on the chalk, and in places mixed up with the clay and alluvial matters from the river, but in general it may be considered as a deep, sandy loam resting on the upper chalk, which chalk again shews itself in the Isle of Thanet, where it is in general covered with a light rich loam.

In giving this account of the soils and strata, it should be known that they lie, on one another, as the edges of the leaves of a book would do, when pressed to an oblique direction, the edges rounded and sloped

back to different positions; the soil breaking out, or denuding at the surface in regular layers, according to the acuteness of the dip with the horizon. In some situations a leaf or two of this earthen book is missing, being covered to a great depth by the superincumbent one, but the leaves are never found misplaced.

The principal parishes around Canterbury, where the hop is cultivated in loam above the chalk, are Beaksbourne, Bishopsbourne, Boughton, Bridge, Chart-ham, Chilham, Adisham, Harbledown, Ash, Charing, Westwell, Petham, Hardress, Elmstead, Wingham, Woodnisbro'; and up the River Stour we have Ashford, Chart, Little and Great Sellinge, and others on the green sand formation, or Kent Ragstone Hills. In the vale of the oak tree clay, we find Staplehurst, Frittenden, Smarden, Bithersden, &c., and on the iron sand-stone formation, Cranbrook, Goudhurst, Hawkhurst, Horse-monden, Marden, Rolvenden, Tenterden, Woodchurch, and others of minor importance, all which places contain more than fifty acres of hops in culture. The mineral nature of the above-named clay and iron sand will be more particularly described under the Sussex collection. The district now described comprises 136 parishes, which, in 1831, had 7,544 acres of hops.

The hops of Canterbury are not in general of so large a kind as those of the neighbourhood of Maidstone, the strombiles being smaller and more compact, but they are heavier as to their bulk, and contain much of the pungent bitter; hence they obtain the best price given for Kent hops, and are known as the East Kent produce.

At Bourne, near Canterbury, there is a piece of hop-ground, which it is known was a plantation in the reign of Queen Elizabeth in 1560. During her reign the prejudice lingered, that this perennial rooted plant injured the ground, as well as the malt extract into which it was put; and thirty years before this period, the citizens of London, the learned and famous

city ! petitioned the Parliament against two nuisances, no other than Newcastle coals, in consequence of their stench—and of hops, because it spoiled the taste of their drink, and endangered the health of the people ! But the rulers were, fortunately, wiser than the ruled, *(they ought always to be somewhat in advance of the mass of the nation.)* It is said, that Queen Elizabeth and her maids of honour breakfasted at seven o'clock on beefstakes and horns of strong beer ; if the hops had spoiled her drink, the evil would not have continued long in existence.

SUSSEX DISTRICT.

The next district in the south of England of any importance in the growth of hops is that of Sussex, which in the year 1833, paid 80,794*l.* to the excise duties. In describing the geological structure of this district, we shall be confined principally to the iron sand formation, which forms a considerable feature in the surface, as well as the subsoil of the county, one-third of which is occupied by it. The hops are cultivated in the eastern part, adjoining the county of Kent ; and the excise return extends into a portion of Kent, the soil of which places is of the same nature, the ferruginous or iron sand of geologists. From this soil London was, 200 years ago, principally supplied with that useful metal, smelted with the charcoal made from the oak of the adjoining weald ; and in some of the parishes now to be named, the pits and the slag of the furnaces are yet to be seen.

The principal places embraced in this district return, each of which undernamed contain more than fifty of acres of hops, are Ashburnham, Brenchley (Kent), Burwash, Beckley, Brede, Battle, Bexhill, Catsfield, Crowhurst, Dallington, Ewhurst, Frant, Fletching, Goudhurst (Kent), Heathfield, Eden, Icklesham, Lamberhurst, Mayfield, Mountfield, Northiam, Penhurst, Peasmarsh, Rotherfield, Rye, Sandhurst, Speldhurst, Sidlescomb, Tunbridge Wells (Kent), Ticehurst, Uckfield, Udimore, Wadhurst, Warbleton-

Waldron, Watlington, &c., all these are in this district 94 parishes, which, in the year 1831, contained 8,138 acres of hops.

Throughout this district the iron sand and stone abounds, but the hop is found to succeed best in situations near rivers, where the clay which intervenes amongst the sand, has become mixed up with the alluvial deposits of the vallies.

The prices at which these hops are sold in London fully shew that the soil is not so good, or that the management is worse, than those yielded from Middle or East Kent. There are but few hops produced from the wood valley or oak tree clay, which surrounds the nucleus of the iron sand hilly elevation of this county and that of Kent, it is only where the clay and the sand join, shake hands, and become mixed up together, that the culture pays the farmer well for the expense and trouble of poling, as at Ninfield, Crowhurst, Frantfield, Fletching in Sussex, and Woodchurch, Halden, Chiddingstone, Biddenden, Fritenden, Pembury, Penhurst, &c. in Kent.

The sand stone hills just described are seen again in Surrey, at Godalming, the hills south of Farnham, at Frensham, and at Haselmere; it is the admixtures with this sand which constitutes the fertility of the vallies of the Wey.

HEREFORD DISTRICT.

The county of Hereford next claims our notice, as it paid, in 1833, duty to the amount of 24,160*l.*; and here we have to consider a soil quite different in structure and geological *situ* to those we have been reviewing. We are here amongst the transition and oldest secondary formation, whereas we have before been travelling over the latest formed secondary and tertiary deposits. This district of Hereford (which in the northern parts takes in a part of Worcester,) is composed of 173 parishes, of which 81 have culture in hops of more than fifty acres, the whole comprising a surface of 12,371 acres in 1831.

The county of Hereford is nearly occupied by the red soil, known as the old red sand of geologists, being the debris of the rocky and mountain country about which it is found; the sand being in large grains, and composed of various materials, as is also the stone, which indeed may be considered as a conglomeration, rather than sand alone,—the colour is given principally by the oxide of iron. A lime stone is also found in the county, as at the Malvern hills, where coal with the intervening strata of clays, are also discovered. The clays, where they have been washed out of the strata and mixed up with the sand, give a feature of compactness to the soil; the stratum of clay will generally be found in the valley, having offered less resistance to the running of water, when the surface of the earth has been successively undergoing the action of currents and tides.

Wherever there is a depth of mixed earths the hop plant will flourish, and here we find it, in the rich vales of the county, where also fruit and corn abound; the Champagne appearance of the vallies and the edge of the adjoining county of Worcester, bespeak it to be a fruit and a cyder country. The principal parishes in which the hop is cultivated, and in which there are fifty acres in culture, are the following:—Bromyard, Bishop's From, Castle From, Eye, Eardesland, Hope, Kimbolton, Leominster, Lindridge, Ledbury, Stoke Lacy, Tenbury, Torrington, and 68 others, which (unlike the district of Canterbury) are wholly occupied by a uniform soil of red sand, more elevated from the level of the sea than is the next district of the new red sand-stone and marl.

WORCESTER DISTRICT.

The description of the soil of this division approaches very near to that of Hereford, from which it is divided by the ridge of mountain lime-stone, known as the Malvern and Clee hills; but yet the soil, although red, is of a different character; it is a rich red marl, and is called the "glory of England as

agricultural land ;" all kind of crops grow well in it. There are some strata of blue clay amongst the red marl, and in the southern part of the county the surface is occupied by the blue and white lias lime, the general feature of the surface soil being a happy mixture of minerals, known as the red land of the West of England. In the year 1833 this district paid 5,122*l.* excise duty. The principal parishes where the culture takes place, are Clifton, Cotheridge, Hanley Castle, Leigh Malvern, Martley, and ten other places, where 50 acres are in culture, and in all there are 35 parishes in the collection, comprising 2,046 acres.

In the extreme north of this county, there is an excise collection, under the district of *Stourbridge*, which in 1833 paid 1,543*l.* duty, it consists of 16 parishes, and contains 716 acres, extending into the adjoining county of Stafford; the soil is of the same red marl which has been described in the Worcester district. So extensive is this *red sand and marl* that many whole counties are covered with it, and it is so congenial to the growth of wheat, that the old stubble will, under some circumstances, shoot up again and produce a half-crop the following year. (See *The Golden Farmer*). In some places also in this soil the farmers never dress their corn land with stable dung, as it would drive their crops into too luxuriant a state; the wheat when grown naturally, produces the greatest proportion of flour, as compared to the weight of corn, of any other district.

Shenstone in Staffordshire is one of the parishes in this district, and the whole collection being near the mining and manufacturing towns of Dudley, Wolverhampton and Birmingham, great stimulus is given to the produce, by the ready and active markets of so populous a neighbourhood; and in this part, nearly every seller of beer is his own brewer.

Near to Stourbridge there are many coal mines, the surface soil over which is far from being of a rich agricultural character, as the earths of the coal measures are not so happily mixed, the magnesian earth,

is often found in them, and this earth is exceedingly sterile for corn crops as well as hops. There is in the neighbourhood of Birmingham, and particularly towards Warwick, quantities of white gravel stones on the surface, as well as in pits, similar in form to the rounded flint gravel in the environs of London; this white gravel is a gypsum, a debris, rounded by the action of water, after being washed out of the red sand formation, which contains strata of this sulphate of lime; these stones collected, burnt, and pounded would be a manure for many kinds of green crops.

It has been remarked, that if the hop culture was not a speculative crop, it would not be worth the trouble of cultivation, mankind being fond of a game of chance; this chance game was never more fully exemplified, than in the districts of Worcester and Hereford, they paying in 1823 only 4*l.* 3*s.* out of 26,057*l.* the collection of old duty for the whole kingdom; yet, in 1825, the same districts paid 11,911*l.* out of a collection of 24,317*l.*, nearly half the duty for that year. (*See the tabular account of districts.*)

HAMPSHIRE DISTRICT.

The next division which elicits our attention is the Hants, including Farnham, in Surrey. The district paid in the year 1833 duties to the amount of 5,850*l.*, in 1835 it paid 4,386*l.*; in 1831 there were twenty-eight parishes included in the collection, containing 1,302 acres, and paid duties amounting to 8,715*l.*; of this quantity of acres, Farnham consisted of 898 and Crondale 142 acres, Hawkley 39 and Steep 33 acres.

The district now to be noticed being varied in its geological position and mineral structure, will again call forth the notice, that all soils are the remains of broken up rocks and earthy strata; that the sandy soils are but the particles broken or rubbed off larger siliceous stones, as the sand on the sea-shore is the effect of continual rubbing of one stone against another, by the action of the waves, this being repeated many hundred times every returning tide. A deposit

on the sea-shore will be either silex, as sand—clay, or argillaceous matter, as a mud—chalky, or calcareous matter as a marl,—or it is the union of these in one proportion or another. It is to a similar cause that we have to attribute all the surface agricultural soil, together with decayed vegetation, the washings of the hills, and depositions from running or stagnant waters.

Sir Humphrey Davy, in his "Agricultural Chemistry," says "To form a just idea of *soils*, it is necessary to conceive different rocks decomposed or ground into parts, or powder, of different degrees of fineness; some of their soluble parts dissolved by water, and that water adhering to the mass, and the whole mixed with larger or smaller quantities of the remains of vegetables and animals in different stages of decay."

[On the subject of soils and the means of ameliorating them, the reader is referred to the author's essay, "The Golden Farmer."]

In all instances, where there is a proper proportion of carbonate of lime mixed with the soil it gives fertility to it, for the produce of nearly all sorts of agricultural crops; and it is found also to act beneficially in the growth of hops; for wherever the hop flourishes in a superior manner, there is found the carbonate of lime, either as a marl, mixed up with the soil, or as calcareous sand; and this is particularly the case with the district we are now about to review.

In describing the hop district of Middle Kent, the vale of Holmes Dale was mentioned as a valley between the Kent Rag-stone hills and the chalk; we have this vale again at Farnham, which may be considered as its termination in Surrey, being traceable to Guildford, Dorking, Ryegate, Godstone and Westerham, to which we traced it in Middle Kent; from Farnham this valley continues southwardly to Alton, a point where the North and South Downs commence.

The subsoil of this valley is a rich calcareous

marl, *the golt clay of geologists*; to the north of Farnham High-street, there is a great depth of loamy soil overlaying this chalky marl, with which it is mixed; this is called, "The heart ground of the Town for hops, and the Dogflood Fields." The nature of this marl may be seen at Seal to the east, and rising Bentley Green, to the west of Farnham; it may also be seen in most parts of Alice Holt Forest, the subsoil of which is of this earth. By analysis this marl is found to contain half carbonate of lime, and in about that proportion the lime is found to exist in the red land marl of Worcestershire, which has been noticed as coloured with the red oxide of iron, but the golt marl is of a greenish blue, being a peculiar metallic oxide.

So good is this marley soil for the growth of wheat that it will produce that grain in succession for several years in the same field, without exhausting its powers of fertility. Wheat and beans in succession is often the rotation on such tenacious soils; the beans being drilled at wide intervals enables a partial fallow to be made during the summer, and indeed in the previous winter a six months fallow may be made.

Of the value of this Farnham land some estimate may be formed from the price at which it sells, some acres having been sold as hop-ground at 600*l.* per acre!! Many pieces would find customers at 25*l.* per acre per annum, rental, and much of the land stands rated in the assessment-book at 10*l.* per acre! In the year 1834, for an acre of hops an offer of 200*l.* was made for the crop on the ground as it stood, which was refused. Some ground in this parish scarcely ever fails in producing a good return for the culture, known as the Dogflood Fields, the Heart of Moreton's Fields, &c.; these contain a large proportion of calcareous marl.

The hop is cultivated on the hills near the town, where we find a gravelly clay on one side, and an iron sand, with black iron stone on the other. Hops may also be seen in cultivation in a thin soil close to

the chalk, in leaving the Hog's-back to enter Farnham Valley, near where the golt clay crosses the high road. ("The *Hog's-back*" is a ridge of chalk, running from Guildford to near Farnham, having the Golt clay valley on one side, and a stratum of the London clay and plastic clay on the other, which latter consists of a valley, formed between the Bagshot sand district and the chalk ridge.)—(*For further information on the geology of this district, see the article "Geology" in Baxter's Library of Agriculture.*)—Likewise in a deep loose (Bagshot) sand at Aldershot and Hungery-hill, in the plastic clay and London clay at Ash and Hale, and in the Golt clay at Seal, Bentley, south of Farnham High-street, and at Bagshot. Thus have we traced the culture in all sorts of soil within a few miles of Farnham. In the iron sand, south of the town, there are also some considerable grounds, and although situated on a high hill, they yield an ample return for the outlay, as Weedon Hill and Wrecklesham. At Crondal, the hop is often cultivated with much success, although the site is on the upper chalk; but yet there are many tenacious loamy spots, which vie with parts of the Farnham ground.

The other principal parts of this collection are towards Petersfield, as Steep and Hawkley, situated on the edge of the chalk ridge; but as our geological inquiry is so near some other considerable hop growing parishes, it will be well now to name them, although they are exciseable under the Salisbury collection, in which they indeed form the principal collection, as Alton, having 181 acres, Bentley 137 acres, Benstead 167 acres, Froyle 100 acres: there is also Selbourne, no inconsiderable place in this locality. All these places have a good holding soil, a mixture of the plastic clay with the chalk marl; and here men cultivate their hops with great success, it being done in a masterly manner, on scientific principles.

The continued valley to Alton may be considered as the Golt clay continuation, with the windings of the

Wye river (which rises near Alton), skirted with the tenacious chalk marl.

The chalk hills to the north-west of Alton form gentle sloping terraces, and are covered for the most part with a good depth of holding soil of a reddish argillaceous character, with much diluvial fragmentary flint gravel. To the east of the town, the soil approaches to a calcareous marl, in agreement with the lower chalk formation, without flint, of which the hills on that side of the town consists, forming terraces of hard chalk stone. This stone is by some geologists considered, or rather termed, the upper green sand; but as it is of the same nature as the Godstone fire stone, with thin strata of chert intervening, it is here taken as part of the lower chalk marl, being so considered by Phillips and Conybeare in their "Geology of England and Wales," on which head they say, "The lower beds of the chalk marl often pass into those of the green sand, and it is somewhat difficult to catch any precise characters for a formation which is thus rather intermediate between two others, than possessed of independent features."—"In the upper beds, near its junction with the chalk, the cretaceous matter prevails; and these usually appear as chalky beds, distinguished from the true chalk by a greyish or mottled character, and by a more laminated texture, and by falling to pieces when wetted and dried again. It greatly varies in hardness, but will not usually mark like chalk, and often acquires sufficient consistency for architectural purposes; its aspect is also more gritty than the chalk usually is; where the argillaceous matter prevails in excess, the Golt, a tenacious argillaceous marl of the ordinary character, and of a blueish grey colour is the result." In the vale of Alton, and towards the south-east, there is a continuation of a happily mixed soil, a good holding land, with plenty of calcareous matter, and resting on a subsoil of chalk marl, or the lower grey chalk. The turn towards the east of the chalk escarpment, and the bold front which it forms at Sel-

borne, four miles from Alton, gives the country a picturesque beauty not to be surpassed in the county; the soil of Selbourne is chiefly a calcareous marl, resting on the lower hard chalk, or fire stone, of the undermost strata of chalk, which has interleaved chert, and a hard blue lime-stone interspersed amongst it, somewhat similar to the blue lias, or blue Mountain lime-stone. On this soil there are many acres of hops, cultivated successfully, from Selbourne to Binstead, where it is called the "Malm-land," and is the glory of that part of Hampshire for corn.

The above-named Selbourne is the spot rendered so famous by the Rev. Mr. White's natural history of the place; and, indeed, it is interesting from the deep ravines and glens with which the place is surrounded. The over-hanging woods and deep precipices; the trickling streams, the expansive lakes, the well-cultivated land, with the vale of those streams, of which the one runs into the Thames at Weybridge, and the other into the sea at Little Hampton,—give, from the top of the "Hanger Wood," one of the most interesting panoramic scenes that is any where to be found. But, to a geologist there is something more than a mere view; for, in the distance, is the commencement of the iron sand-stone formation in Sussex, Wolmer Forest, known by the absence of large trees, and the carpet of heath, a surface so highly characteristic of its appellation, "Iron sand," the stone being found to contain more than half iron. This ferruginous formation is cut off from the chalk marl land by the vale occupied by the tributary stream to the Arun, which runs over the Golt marl. Here, the cottages and their gardens, under the bold escarpment of the chalk,—Mr. White's garden and ground rising on the Cliff,—the zig-zag path to surmount the "Hanger-hill,"—the neat church, with its white tower,—the incumbent's house and garden, with a luxuriant ever-green hedge, the lawn and thriving shrubbery,—give to Selbourne such picturesque beauties, that a reader of the "Naturalist's Letters," and an admirer of na-

ture, cannot but be rivetted to the spot. Nor are less striking, the perpendicular sides of the deep cut roads, the Mountain lime-stone rock appearance of the hard chalk, wanting only the greater dip of strata to make it more like that rock; for here, like the stone of Derbyshire, jets of water are ever running out of the clefts. The hop grounds are also not an indifferent subject of reflection; the cottager in September having shut up his house, shews that all the family are gone *hop-picking*, and when it is considered that a poor family can thus make a second harvest by earning 6s. or 8s. per day at a payment of 1½d. per bushel; it is pleasing to see such means provided for their happy activity. Mr. White, in his Selbourne, speaking of the junction of the sands with the clay of the village, describes it as "a wet sandy loam, remarkable for fine trees, but infamous for roads;" the white marl land "neither fit for pasture nor the plough, yet kindly for hops, which root deeply into the free-stone,—the white soil producing the brightest hops," the poles for the spiral growth of the plant, and the charcoal for drying, making Selbourne well situated for the culture.

Mr. White remarks, that Virgil's account of the culture of vines corresponds very much with the culture of hops, and instances perpetual digging and hoeing, tyeing to the poles, pruning, and harrowing with a triangular hoe; and he says, "perhaps it might be proper, though certainly not now part of the practice, to leave a number of *male plants* that the farina might impregnate the blossom; for females, without their male attendants, are not in their natural state." (*See this subject under the head Botany.*) Mr. White wrote his work in the year 1788, and shewed himself an observer and a lover of Nature; he knew that the hop growers grubbed up all male hops, because they did not bear the hop, which directly yielded them a profit; he also goes so far as to say, that, in consequence of the want of males, we may attribute in some measure the frequent failure of crop,

so incident to hop-grounds; no other growth, cultivated by man, has such frequent and general failures as hops; and he mentions a circumstance of a violent hail-storm, June 5th, having cut off the top of the hop-bines at Selbourne, and that the growers at first considered them much injured, but the injury appeared to make the side shoots grow more luxuriantly, and on these came an excellent crop; he, therefore, suggests it would be better to cut off the tops of a luxuriant growth.

SALISBURY DISTRICT.

In describing the nature of the soils of this collection, it will be observed that their structure has already been commented upon; for although the return of 1833 was 3,302*l.* for excise duty, it will be seen that the parishes last mentioned in the Hants Geological division were those which paid the principal part of the duty, viz., Alton, Bentley, Binstead, Froyle, and Selbourne. In this collection, there are 36 parishes, which in 1831, comprised 1,026 acres, and in that year paid 6,004*l.* duty. The other small collections in this district are situated on the deep loams above the upper chalk, as at Odiam, Hartley, and Longsutton, the soils of which assimilate so near to Canterbury that it is not necessary to go again over the description, further than to remark as to the general feature of the Wiltshire Downs, that in the vallies between the chalk hills, there are depths of mixed earths, equal in fertility to any of the county, also on the banks of the Nadder river, where in the Vale of Wardour, is also found the Golt marl, so productive in hops at Farnham; and here, in this vale, we may discover, at the foot of the chalk hills, the green sand formation, so characteristic of a hop soil in Middle Kent. The banks and alluvial deposits from the rivers, give the chalky plains around Salisbury a rich agricultural feature. The overflowings of a river running through and over chalk, always leave behind a calcareous matter, rich in vegetable stimuli, and

Salisbury is the conflux of many such rivers, the Nadder, the Wily Bourne, the Bourne, from Collingbourne, with other small streams emptying themselves into the larger one. The Avon of Wiltshire, which runs for 25 miles through the chalk downs, necessarily brings with it much fertilizing earthy and vegetable matters, to be deposited on its edges, at every overflowing, and hence the riches of the adjacent country. It is a source of regret, that a river so loaded with fertility should so soon empty itself into the channel as it does, at Christchurch, when it might, like the Nile, be made to flow periodically over its banks, and give vigour to the sandy soils of West Hants.

LINCOLN DISTRICT.

The most northern district from which an excise return is made, is that of Lincoln, more generally known as the *North Clay district*; it paid in the year, 1833, 1,626*l.* duty; in this collection is included East Retford, which is in Nottinghamshire, and is the mart for hops in that part of the country. The collection includes 22 parishes, of which Askham, Bough-ton, and Markham, are the principal; there was in 1833, 524 acres in the district, and that year they paid 3,920*l.* in duty.

In calling attention to the soils of this district, the reader is referred to what has been said of the red land soil, or marl, of Worcestershire, the same surrounds East Retford, its name implies the colour of the soil, being a perversion of the word red-ford—many names of places in that part, are derived from the colour of the ground. At Lincoln and at the edge of the shire, there is a variety of soil, which has not yet been described, overlaying the red marl; it is the blue marl, and has lime stone formation, running along the edge of the county, and on the East of the river Trent; this blue marl, when mixed up with the red, by no means injures its fertility for hops, or corn, for it contains a still greater proportion of carbonate of lime, than does the red marl; and of clay and iron

it has a proportion, varying from the dark blue to the cream coloured white, which are the colours of the stones obtained from the stratum; the blue lias lime stone is used for lime, in its various applications; and the other, the white lias, is used for *lithography*. Above this blue soil, and constituting a stratum on which the City of Lincoln is built, there is the oolite formation, running parallel with the blue lias, from the river Humber to beyond Oakham, in Rutlandshire.

The character of this soil and stone, is of a peculiar kind, being a lime, partaking the appearance and character of sandy particles, and the stones when magnified, have the resemblance of globules of lime cemented together, intermixed with much shelly matter; hence the name of *oolite*, *egg*, or *roe-stone*. The eastern side of the county is occupied by the close clays, and alluvial soils, with some chalk and *green sand*, to the northern part of it; hence the county has a variety of soil, and the principal part is composed of such calcareous and argillaceous matters, as would give vigour to hops and corn, when properly managed; Boughton, named above, is in this soil; Markham, is in the red soil. The hop grounds in this district are called yards, as the Upton yards, Beastwood yards, the Bell-moor, Clarbro', Bevercotes, &c. (*For the names of other places, see the list of parishes.*)

The Beastwood flat in the parish of Askham, is considered "the flower of the North Clays"—where often 20 cwt. per acre is gathered.

ESSEX DISTRICT.

We have now to notice, this South Eastern part of England, and then take leave of this part of our subject, as far as relates to the geological and geographical notice. This district paid in 1833, 1,369*l.* and in the year 1831, there were 30 parishes, included in the collection, of which Castle Hedington, Halstead, Weathersfield, were the principal, and consisted of 406 acres, and in that year the collection amounted to 2,393*l.*

The soils of this county, are not so varied as those we have been considering, for here we have nothing but clay and sand, with their admixtures, and the upper chalk, on which they repose, of various depths; in few places does the chalk appear at the surface, and where it does, it is found to be the soft chalk, with strata of flint, as at Purfleet on the side of the Thames; which chalk when mixed with the alluvial soil from the Thames deposit, or other rivers, constitutes an agricultural and a hop soil, not to be surpassed. Some spirited and moneyed hop farmers from Kent, have planted several parts near the Thames, and in favourable seasons, they get a tolerable crop.

The London clay so characteristic of this county, may be traced, from the Thames, near Herndon on the hill, to Romford, Woodford, Epping, Chipping Ongar; to near Chelmsford, Maldon, Messing, Great Bromley to Harwich, and throughout this circle we have a subsoil of strong clay, with variations of alluvial and diluvial gravel and sand; beyond the circle thus traced, we find the chalk occasionally washed into, and discoverable on the edges of rivers; as at Sudbury, Chesterford, Bishops Stortford, Roydon, and at Thurrock near the Thames. The principal hops are grown in the sandy loams at Castle Headingham, and Halstead, on the edge of the Coln river, and at Weathersfield on the Blackwater; these soils being rich from alluvial deposits, their produce will vie with almost any in the kingdom.

The several other districts which contribute to the hop duties, making payments under 1,000*l.* will not be particularized further than to refer them to the other district soils. As Suffolk stands the highest, it may be remarked, that the soil is similar to that around Canterbury; it is at Stowmarket where the principal are grown, and indeed, are there cultivated with as much success as in any part of Kent, being in the valley, at the commencement of the river Orwell; the district included 18 parishes, comprising 139 acres.

GEOLOGICAL OBSERVATIONS.

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Names.	Duties in		Acres in		Parishes.	Remarks on the soils of the Districts.
	1831.	1833.	1831.	1835.	1831.	
Barnstaple	£36	£11	8	7½	7	Red marl, as Worcester.
Bedford	148	86	31	26	5	Sand and Clay as Weald of Kent.
Cambridge	29	10	4	4	1	Do.
Chester	2	1	1	¾	1	Red sand, as Worcester.
Cornwall	92	7	5	5½	8	Do., as Hereford.
Derby	632	262	129	131	2	as Worcester.
Dorset	64	88	16	18	1	Sand and Clay as Middle Kent.
Exeter	34	44	21	15	1	Red marl, as Worcester.
Gloucester	47	8	7	8½	2	Do.
Grantham	141	70	28	29	3	Oolite, as Lincoln.
Isle of Wight	2	1	1	1	1	Oolite, as Lincoln.
Marlboro'	50	3	10	11½	1	Loam, as Canterbury.
Norhampton	12	3	1	1	1	Sand, as Middle Kent.
Oxford	34	20	10	14½	1	Oolite, as Lincoln.
Plymouth	16	6	5	4	2	Primitive Debris, as Hereford.
Reading	9	4	4	2¾	4	Loam on chalk, as Canterbury.
Salop	8	2	3	3	1	Red marl, as Worcester.
Suffolk	949	419	139	154	16	Loam on chalk, as Canterbury.
Surry	73	19	16	12½	3	Loam and loam, as Essex.
Uxbridge	35	14	7	6	1	Loam on chalk, as Canterbury.
Wales	436	239	129	115	15	Primitive debris, as Hereford.
Wellington	82	64	16	17	1	Red marl, as Worcester.
England and Wales {	Old. £ 74,864 New. 129,259	Old. £156,906 New. £115,973	Total of England. 47,129	Total. 53,816	in all. 787	

[See the Map of Soils of S. E. of England.]

D D Mid Kent Green Sand.

F F Sussex Iron Sand.

Before the subject of soils is dismissed, it should be remarked, and indeed always borne in mind, that nature makes nothing in vain ; that all soils are capable of producing some vegetable or other, without further manure than what is afforded by the rains, dews, sun, and air, together with the decomposition of minor vegetables, lichens, and mosses, which will grow on an upright tombstone ; the decomposition of one vegetable is the pabulum for the growth of another, as may be particularly instanced in the heaths, broom, furze, fern, and mosses, which thrive most in a sterile blowing sand. Indeed those soils which are pronounced imperfect by some persons, are actually the most perfect for some vegetation ; and it is the business of man to find out those vegetables, for how else could the earth be so covered with beauty ? The soil, the climate, the situation, and the taste of more than forty thousand species of vegetables have to be studied by man.

There are many parts of England not mentioned or embraced in the districts which have been reviewed, where hops might be grown with advantage, and which a person conversant with the culture, and with the structure of the earth, might be able to point out ; no part ought properly to have a greater surface under culture, than what the district around requires, or there are hands to gather in ; because, by spreading the culture, many expences may be avoided ; such as carriage, commission, dealers' profits, inconvenience of obtaining pickers, &c. ; consumers in distant parts of the kingdom, have now to pay a considerable part of these charges. But, the South of England has many advantages over the North, for the growth of hops, particularly near the metropolis, which is a principal mart, and place of consumption, and where there are opportunities of sending them all over the world ; moreover the soils in the south have a greater mixture of calcareous matter, from the ranges of chalk hills, which run from Norfolk to Dorsetshire, branching from about Alton to Dover through Surrey and

Kent, and from the same place to Beachy head, through Hampshire and Sussex. The South of England has also earlier harvest than the north, yet there are many situations northwardly which have deep rich loams and calcareous subsoils, where hops may be cultivated to advantage.

The advantages of hop culture to the farmer, may be seen in the pleasure and eagerness with which it is attended to, and pursued, and the affluence it has always diffused; to say nothing of the properties which it has aided to accumulate. In no way is the culture injurious to an estate, unless it may be in taking a considerable portion of manure from other parts of the farm; but this is obviated by the purchase of extraneous manures, such as will in the following pages be recommended. The present high state of culture, on many of the Kent and Sussex farms, may in some measure be attributable to the increase of property arising from hop culture.

MANURES, THEIR CHEMICAL, AND MECHANICAL ACTION IN THE SOIL, AND TO THE ROOTS OF PLANTS.

Our next province is to inquire into the several matters, which will give additional vigour to the growth of hops, in the several varieties of soil, which have been noticed, and also to remark on the general practice of manuring.

In the front of all inquiry on this head, it must be remarked that the roots of hop plants penetrate beyond the reach of any dunging on the surface, and it must also be understood that the principal effect of all manurings, is to make the soil hold moisture, in that particular degree which the nature of the plant requires. Now this object may be obtained, without either animal or vegetable decayed substances, as is evidenced by those soils which need no manuring; our business therefore is, to find out in what particular other soils differ from those that are fertile, and endeavour to imitate the latter.

That certain lands will produce corn and hops without manuring, it is only necessary to refer to the marsh land on the banks of the river Thames, to Farnham, or to the red land soil of Worcester or Devonshire. Lord Kames, in his "Gentleman Farmer," mentions a field on the banks of the Carron river in Scotland, that had the 100th successive crop of oats without manure when he saw it 80 years ago. At Frensham in Surrey, a plot of ground belonging to a cottager is shown, that has grown 40 successive crops of potatoes, without further manure than the haulm left on the surface to rot; where then lies the secret? we will endeavour to throw some light on it, although it is not our province in this essay to go into a lengthened dissertation on the chemical nature of soils and vegetable food, but rather to speak in general terms of the effects of manures.

As the roots of hops incline to tap downwards, as well as to throw out lateral shoots, and, (as will be described more particularly under the head of "Botany,") the roots throw out many swelling tuberosous fibres, it is necessary to vigorous vegetation, that the soil should be kept very open; and before a planting takes place, and periodically afterwards, should be moved deeply between the hills, trenched two or three feet deep, and well broken, unless the subsoil is very open, and even then it will be the better for the amalgamation, that must necessarily take place in turning it over as the particles of soil cohere together. When this is done, [the soil will not suffer from a want of moisture in the summer time; for if thus opened, and the surface kept properly tilled, so that it does not cake over, (which most soils will do, when kept long untilled,) the superabundant moisture in the rainy season will sink down and be held, as in a sponge, by the soil, and given out to the plant as it requires the moisture during the dry months of summer; and moreover, the soil will then be enabled to absorb the moisture, that falls in dewy nights after hot days; and this deep

tillage, will be more effectual, if the top and bottom thus moved are of different earths.

On this head we have to consider the necessity and benefit of *mineral manures*, for according to the deficiency of lime in the soil, should be the dressing, either a calcareous marl, soft chalk, or burnt limestone; this it is which gives to soils an absorbent quality; and if the soil has already too much of this calcareous material, then will a stimulus be given to vegetation by a dressing of clay or of sand, according as the disposition of the surface, is tenacious or friable. But these dressings can only act immediately, on the surface roots, which are yearly thrown out, as the bine proceeds up the pole, and may be discovered, and laid bare between the hills, and are often shown when a heavy rain or flood runs over the surface; still this surface dressing does a service to the rootlets, which grow within its reach; but to put manure immediately around and on the hill, as some hop farmers have been known to do, is like putting food on a man's head, and telling him to eat it; indeed, it is manuring the poles, instead of giving food to the mouths of the rootlets. In some parts of Kent, woollen rags have been a favourite manure, but of late years, supposed to create the *mould*, and much discontinued; still some persons are using them, and good effects result therefrom, though it is little more than putting a material into the ground to act like a piece of sponge, in holding the moisture for the roots, according as they may require their food; not but the animal matter, and the little oil remaining in the wool, also act as an invigorator, when it is decomposed, but the rags are not worth the great expence of about 7*l.* per ton in London, and the carriage to add to that amount, when perhaps, the parties who purchase, suffer the juices from their dung hills to run into their ponds, when it may be absorbed by a soil of an opposite nature, to that on which the manure is required. When soils are saturated with these juices, it is an excellent manure; a chalk, a

sand, a clay, or their mixtures from waste ground; might be used for this purpose, and put under every dung yard, or dung mixing, by which they would be saturated with the very essence of manures.

Several manures have been recommended, and found to answer the purpose of giving energy to the plants; but in every dressing the nature of the soil should be taken into consideration; those manures which contain a lime always give effect in soils that do not contain any, for instance, chalk is a carbonate of lime, but—

Chalk burnt and slacked	is an hydrate of lime, changes to a carbonate.
Chalk marle	is a carbonate of lime and clay.
Sugar scum	is a do. animal carbon with oxides of earth.
Bones boiled	Phosphate of lime.
Soap boilers' ashes	Carbonate of lime and alkali.
Animals fed on grain, their excrement always contains }	Phosphate and sulphate of lime with potash and carbon.
Animals fed on vegetables }	containing phosphate, carbonate, and sulphate of lime, potash, carbon, soda, ammonia, gelatine, albumen, the bases of sugar and oil.
and animals, yield a matter }	
Gypsum	is a sulphate of lime only.
A stone is quarried in Nottinghamshire and other parts,	which is a magnesian lime, and is injurious to general vegetation.
Refuse from skimmers' yards .	is composed of hair, wool, lime, and animal excrement.
Animalized carbon	is composed of chloride of lime, a carbonaceous base, and human feces.

The above list of manures will sufficiently show the activity of lime in most of the dressings, which with potash and carbon form the principal bases of vegetables. Silix also enters into the composition of straws and the epidermis of corn, but lime gives solidity to the flour of the grain: hence the necessity of grain to form the bones and shells of land animals; and fish have their bones and shells from the lime contained in the water, washed against a calcareous coast, and there shell fish abound.

The excrement of animals will have different qualities, according to the nature of its food. Human excrement contains a greater variety of constituents than that of any other species of animal that has been examined ; and Sir H. Davy in his *Agricultural Chemistry*, says, page, 269, " Night soil, it is well known, is a very powerful manure, and very liable to decompose. It differs in its composition, but always abounds in substances composed of carbon, hydrogen, azote, and oxygen. From analysis, it appears, that a part of it is always soluble in water ; and in whatever state it is used, whether recent or fermented, it supplies abundance of food to plants." All substances yielding different proportions of carbon furnish food for plants.

The animalized carbon mentioned above is a preparation of this article made in London under the direction of the author of this work, where also is prepared a manure particularly calculated for the growth of hops.

The decomposition of any vegetable matter is most likely to yield the proper pabulum, for a re-formation of the like vegetable ; as a decayed straw will yield the matter to give energy to the growth of other straws, the particles being in a fine permeable state, readily enter into a new combination : so, therefore, is the decomposition of hops made to form a manure for the plant and thus enter into the new vegetable. The refuse of breweries, the cleansing of their utensils, their cesspools, their refuse yeast, (which is carbonic acid itself), the decomposed hops, &c., are all mixed up with a night soil, and with chemical agency reduced to a state of powder ; and this has been found the most energetic manure for hops at Farnham, where it has been used in considerable quantities. (*See the advertisement at the end of this work.*) The vines and foliage of hops ought to be reduced to a state of mucilage in a wet farm-yard, or slush hole, and then returned to the land as manure.

The manures above described are prepared with

different admixtures according to the nature of the soil, and crop, the object being to condense vegetable bases into as close a compass as possible. The carbonic acid gas is so essential to the growth of all vegetables, that it is no wonder that yeast from breweries is so excellent a manure, when used sparingly and mixed up with other ingredients; carbon with potash are the bases of vegetables, and may be locked up for ages in the lime-stone rock, brought forth by man with the aid of fire, to the service of vegetation; and it matters not how it is given to the plants, whether from the lime-stone, decayed vegetables, or the refuse from breweries.

The constituent nature of various manures is more particularly given in the Essay, "*Cottage Farmer*;" and the propriety of using fresh made animal and vegetable manures is commented on in the "*Golden Farmer*;" but the subject of manures will be again noticed, under the head of Chemistry. Yet the practice cannot be dismissed without remarking, that the best and cheapest manure is obtained by means of manual labour, viz., by a tillage of the surface for the admission of air and water, and giving to the roots fresh soil by the removals; and this tillage should take place as often as the surface becomes flattened down by the spring rains. The roots of hops will always search, and turn, downwards or horizontally, according to the want, or supply of nourishment.

For the first preparing of land for hops, it is a good way to trench a green crop into the ground, as a pabulum for the first shoots, hence an old meadow is often recommended to be broken up for hops: some persons would burn the surface sods, but this should never be done, particularly in a soil wanting in vegetable or calcareous matter, for burning is a driving away the carbon, or soot, in the shape of smoke, this being a manure of the first order. (See "*Golden Farmer*" on *Paring and Burning*.)

Professor Decandolle, of Geneva, has described the base of vegetables as humine, or as some pro-

fessors have termed it, humic acid, from being found in soils. This material has been found ready formed in the soot of vegetables and coals, and may be produced with sulphuric acid and saw-dust, or other vegetable substances, as starch or sugar, and being formed by the carbonized debris of vegetables, and supposed to vary according to the materials with which it is produced, seems to assimilate very much to the bases of vegetables, known as carbonic acid and potash.

CHAP. III.

BOTANICAL AND PHYSIOLOGICAL OBSERVATIONS ON THE GROWTH OF HOPS.

ON PLANTS RAISED FROM CUTTINGS AND LAYERS.

The usual method of raising hop plants is from cuttings in the spring, indeed it is the universal practice; that is, in the early part of the spring the old root begins to bud or shoot from the old stump of the last year's bine, which will have two or more buds; the crown of the root is then cleared, and these old stumps are cut off, or most part of them, the hole covered up, and the crown of the root throws up additional shoots to be tied up the poles. The plant is therefore said to have an annual stem, but a perennial root. The cuttings or old stumps are bedded for a season, to make roots the best way they can from the edge of the cutting; the plant being exceedingly tenacious of life, every portion of the crown cutting that has a bud will grow, and throw out roots from the extremity of the woody cutting; they will make a circle of roots when healthy, and throw up bine from the eyes or buds at the surface of the ground, and other roots will issue from under the eyes.

The shoots of the former year that may have become covered with earth, will make plants, as layers; throwing out many fibrous roots before they are cut off from the stump or crown: this is often the

most successful method of obtaining plants, although it may in some measure weaken the old root; but the layer gets the plants a year forwarder, as the roots* are already formed, when the plant is taken from the old stock; but if all the super-numerary shoots are cut off, after the principal ones are well up the pole, then there can be no sucking plants formed. With cuttings, as with layers, the plants will be the better to have a portion of the old crown; but then the remainder of the old crown is injured by so doing, and the sooner goes to decay, and becomes the prey of insects. If the layer is notched under ground, the roots will more readily be formed about the cut, and may be pegged down in the spring, and many plants made therefrom, in the same way that the grape-vine is multiplied. It is probable that old practitioners will object to this practice, but why it should injure the old stock any more than usual spring cutting it is hard to say.

A cutting from the crown of the root growing so readily, has established a practice which has existed so many years, that with some persons it is thought to be the only method; where the stock is good and in a healthy state, the offspring are likely to be healthy also; but as all things, vegetables as well as animals, are subject to decay and degenerate, there are chances of the hop-cuttings being defective likewise, and when this is the case, the cutting will decay on one side, and the buds and bine will be defective in the heart, like as a willow tree, a cutting will die down one side. That the old stools or crown roots of hops, will wear out and die, is known to every planter, who has to replenish every year, even in the most congenial soils, even in the best ground of Farnham. If cuttings, then, should be taken from these decaying hills, the probability is, that the offspring, the elongation of the plant, will also show degeneracy, sooner or later; how necessary then is it, that plants should be from healthy stocks; although it is known that a piece of ground has produced hops for more

than 100 years, yet during that period perhaps the whole ground had been replanted many times by yearly mendings : continual cuttings at the crown admits the wet and injures the root. Some hop farmers in Kent known to the author have taken their cuttings from hills which they had raised from seed, and they are not yet troubled with decaying hills.

To establish the fact of degeneracy of the hop plant, it may be well to reason by analogy as to other vegetables, which are known to wear out by continual cuttings, and in nothing is it so evident as in the cultivation of fruit trees, particularly the apple, which, from old stocks and old sorts, will be defective in the heart, and cankered in the bark. A writer on the culture of trees, has said, "That when they, or any sort of plants, are propagated from cuttings and in graftings for many years, they become so diseased by canker or otherwise, that although the fruit may be the same, the trees are not worth propagating, as their grafts, though transplanted into other trees, may be considered as elongations of the original tree, and must feel the effects of age, like the tree they were taken from." A number of plants might be mentioned, which have become inferior to what they used to be, and so degenerate from continual cuttings, that the plants fail in growing or producing ; the most common instance of this kind is the potatoe ; and every one who has eaten the new varieties of strawberry can bear testimony to the improvement arising from seed plants, above that of cuttings and suckers.

The rotting or cankering of the roots in the spring arises generally from degeneracy, and not from the attacks of insects as is often supposed. (*See diseases of Hop.*)

We have hitherto considered the root as a piece of stump bine, put into the ground to form its roots, in the best way it could, according to the healthiness of the stock, the fertility of the ground, and the congeniality of the season that may be adopted ; but it is not every cutting that will form a circle of roots ;

for instance, when one side of the cutting dies, only one or two roots will be thrown down, and one or two shoots will come up. The layer, with a portion of the crown, (the roots being already formed before it is cut off), will be the most healthy set.

This mode of raising hop-plants does not produce correct roots, but merely rootlets growing from the broken edge of the bark, and will be similar to the rootlets and fibres grown at nearly right angles, *from natural roots*, raised from seed, which will now be considered.

ON THE ROOT RAISED FROM SEED.

Although nature in her mysterious ways of propagation preserves life in the cuttings of *trees* and *hops*, even when in a defective state, yet she in the plainest terms tells us how to improve on the subterfuge of cuttings, by having recourse to her master-piece, viz., the sexual reproduction of plants. Obtain, then, by the means she points out, a healthy seed, and from it you will have a healthy and vigorous plant in a few months from the sowing. Nature has provided this seed with a wing, that the wind might waft it to a distance; these wings are the only portion now sought after by the growers, they are the petals of this strom-bile blossom. (*See Botany of the Plant.*)

The new and best varieties of other plants or vegetables have been raised from seed, as mentioned in the last article, apples, potatoes, strawberries, &c.

Plump and ripe seeds having been collected from a female hop, which has blown and belled near a male plant, they may be sown in the autumn, in a well-protected southern aspect, the frost kept from them, as they are very tender; or they may be sown in the spring, about March, and kept in the bed until the following spring, when they should be put out at one foot distances: the oftener they are removed the better will be the roots for transplanting.

The first appearance above ground, is, by two seed leaves, (*cotyledons*) pointed, and similar to the hop

leaf, with notched edges ; these two leaves are soon followed by two others, thrown out across the first ; they are readily distinguished from suckers of old plants by the smallness and symmetrical appearance of the leaf ; they must not be disturbed whilst growing during the summer, but set out to make their roots in the autumn or early spring.

These roots will be found very different to those made from cuttings ; four or six lobe roots will be found, with swelling tubes like the roots of a dahlia ; and these will throw off their lateral shoots as they penetrate into the lower soil, which they will do, seeking moisture, and the nourishment which the soil affords, leaving the finer rootlets and fibres, which grow out from these and under the lower eyes, to absorb the nourishment afforded by the surface soil. Each extremity of the fine fibrous roots has a spongy mouth, (*Sponglets*) through which channel only the plant can receive nourishment ; the liquid matter passing up the woody pores to the extremity of the branches and leaves, drawn there by atmospheric influence, giving vegetable vigour to the plant. This liquid food changes its nature by union with the air ; a portion passes off from the leaves, and the remainder returns to the earth by other cellular tubes or pores, to be again carbonized by a union with the vegetable matter in the soil, and then again take its round through the vessels of the plant. The rootlets which grow out from the principal leading roots, and the fibrils growing out from these, and also from the principal roots, should be well understood ; for the fibrils, and the sponglets on their sides are the only means of giving nourishment to the plant. These sponglets may be observed with a magnifier, on a root fresh taken out of the ground ; they are oblong, oval, spongy bodies, very minute, and found only on the fibrils ; they consist of hexagonal cells, which open into the fibrils ; they shrivel up soon after being taken out of the ground, and lie very close to the fibril ; but if the fibril be placed in water they as-

rapidly expand again, swell, and project from its sides, therefore there is no doubt but that the food is taken in by these spongelike terminations, aided by electrical influence. We may therefore conclude that the earth is less exhausted of moisture around the large roots than it is near the smaller ones; hence the nourishment should be given to the plant at a distance from the crown or stem; these sponges also show that the food must become liquid before it is taken up by the plant, and there is also another curious fact, which has been proved by experiment, that these sponges will absorb coloured fluids, but the colouring matter does not pass into the pores of the root.

The pores and sap vessels of vegetables are beyond the comprehension of those persons who have not studied the subject, or been delighted with this wonderful mechanism brought to light by powerful microscopes. A new race of animalculæ is discovered in stagnant water; the sap and the air vessels in vegetables are made as clear to the vision as a piece of coarse gauze; also the different functions of the under and upper surface of the leaves is fully shown; the sun and warm weather being the principal mover of the fluid sap, and occasions a glossiness over the upper surface, whilst the under is performing its functions in the enjoyment of its own shade.

By means of the hydro-oxygen microscope the pores of trees have been so magnified that the oak has been shown to have different sets of pores, according to soil and climate; hence the variety in quality of German, English, or American oak. In the same way we may presume that the hop will have varied pores according to the soil and situation; and the sap will flow rapidly or tardily in accordance therewith. The smallness of the vessels composing vegetables may not be credited by many persons; but let a leaf be held up to the sun, or to a strong light, and this beautiful order of creation will be evident; and it is as complete in the microscopic vegetables

as it is in the loftiest wood of the forest. It may be considered difficult that liquids should rise perpendicularly, apparently against the principles of hydraulics, but this arises from the smallness of the vessels by what is called capillary attraction, and perhaps further by the agency of electricity. How nutrition from the root is derived by the extremities of the leaves is somewhat beyond our present province to inquire.

A proper knowledge of the structure of the roots, and the habits of the plant, may lead to a judicious system of culture. Tillage of the surface is very generally adopted, and by experience is found to have the desired effect of giving vigour to the plant, and moreover is pleasing to the eye, as tending to keep the ground clear of weeds, and with an open surface.

But of the seed-bed, from which we have digressed, if the ground has a very open subsoil the roots will extend four or five feet the first year, and in that time will be fit to put out in a bed to show their sexual distinction ; and in six months more will be fit to plant out in a hop ground for a permanency.

In the month of April, 1835, Mr. Avenell of Farnham, sowed some hop seeds in his garden ; in the following April they were planted in rows to root and flower, and showed their sexual blossoms in July, and indeed run to the tops of twelve feet poles ; out of four hundred plants about sixty proved to be males : in general the seeds will be found to produce nearly as many males as females. With the seedling plants thus raised by Mr. Avenell a garden has been purposely made.

It is necessary that the plants should be removed into a bed to blossom, that the superabundant male plants may be selected, for it is not necessary that more than one in fifty should be saved ; in putting them into this preliminary bed for a year a portion of the long roots may be with propriety cut off, when they will throw out many smaller fibrous roots to take the nourishment of the surface, and then may with

greater safety be removed to their destination ; the structure of these roots will sufficiently show the necessity of having a deep open soil for the plant, indeed it should always be borne in mind that the attachment of plants to particular soils often arises from the structure of roots.

It has been shown that nature is exceedingly tenacious of preserving vitality in the hop, even in the cuttings ; but she appears to be much more tenacious in the seed, for they will grow even after being boiled with the beer ; an instance of this occurred to a farmer and brewer in Kent known to the author, and a hop grower and brewer at Alton had the same circumstance occur. This interesting fact occurred to Mr. Fielder at Alton, who, having some very mouldy hops, which he thought not worth the labour of picking, let them remain on the bine until they were quite brown and ripe, when he had a few picked on the outside of the ground for his own use : near them there happened to have been a male plant in the hedge ; in consequence of which the seed became complete, and many of them in each blossom ; after using them in his beer, he put them as manure into his garden, in the spring they came up as weeds, and upon finding they were hop plants, he had many of them preserved, and can now show them, male and female, in his hop plantation.

It is well known that many seeds from the Indies will not grow in this country until subjected to great heats, or passed through the intestines of an animal ; indeed there are many seeds which grow better for having passed through birds or other animals. (*See the article equivocal generation—under the head Mould.*)

The root of a hop appears to be ever at work, pushing forward its buds, for before the hops are picked, healthy plants, particularly those raised from seed, will show the buds, where the bine would come forth in the succeeding year ; and so much do such plants, as are raised from seed, tiller out at the crown,

that *one* plant is quite sufficient for a hill instead of three or four cuttings as is the usual practice in planting a garden; some plants will make four distinct bines the first year after being raised from seed.

NAMES OF THE VARIETIES.

Botanists do not number more than one species of hop, but there are several varieties, named according to the colour of the bine, the hanging of the fruit, or local circumstances. The grape hop takes its name from the hanging of the strombiles, the cluster being close together like a bunch of grapes, but this will often happen from the season; the lateral shoots will often be four or six feet long in a congenial year, each joint will be four or six inches long, and at each joint there will be two, three, or more hops. If the bine does not grow luxuriantly, the lateral shoot being only twelve inches long, this twelve inches may be nevertheless, a complete bunch of hops; though the joints be only one or two inches long, yet at each joint there may be as many hops as if it had grown six feet long, and will give the appearance of a cluster, or a bunch of grape hops. Those named from the bine, are the Green, the White, the Red; the latter are called at Farnham "the never blacks, or black knots," because they always grow most luxuriantly, and overcome the attacks of insects and uncongenial weather better than others, but they are not considered to produce so fine a hop. Others are named from places; as the Canterbury grape; the Farnham bell, Mayfield grape. Some few are named from the persons who have raised them from seed; as the White bine Williams's at Farnham, being first raised by a gentleman of that name at Badshot place about the year 1780; this is the variety now principally cultivated at Farnham, and may be said to be one of the causes which make that place so famed for hops, they being purchased with avidity by all brewers in the West of England. And now also may be calculated on, the Avenell hop, as that gentleman is particularly careful

from what sort of hop he selects his seed for raising plants. (*See notes at end.*)

At Chevening in Kent, there is the Colgate hop, that gentleman having raised a plantation from a seedling hop he found in his hedge; he also cultivates a proportion of males in his grounds, and gets a fine pungent sample thereby.

There is also the Golden Tips, the Long Square, the White, the Oval, &c. These arise from varieties of soil and culture, and not a little from congenial weather; indeed the season will make hops grow so luxuriantly, that small green leaves will spring out from amongst the petals, and then they are called in some parts, "The King hop."

THE BINE, LEAVES AND SHOOTS.

The spiral growing annual bine of the hop climbs the poles, turning from the right to the left; (*the scarlet runner climbs the contrary way,*) the bine is round, and throws out pairs of lateral shoots at about every twelve inches in height, varying in distance according to the growth; the leaves are thrown out at the base of the lateral shoot, and, on the lateral shoots, where the hop is grown. The outer coat of the bine has a rough prickly surface, when the hand is rubbed upwards, but feels smooth when moved the contrary way, and the stalk of every leaf imparts the same rough feeling; this rough epidermis, when magnified has all the appearance of prickles on a rose bush, and is, chemically, formed of the silicious matter of the earth, hence the necessity of this sand, in the soil, in which it grows, and hence the natural order Scabridæ (rough). The leading bine when injured in its early growth, may be substituted, by an upper lateral shoot, which will take the pole, and grow up similar to the leader bine, if directed that way, the flow of sap being by the injury thrown into it. It is only in congenial soil, and propitious weather that the lateral shoots will grow out to be in length three or six feet, but with such combination they will hang full of hops to

the very ground, though often the lowest branches are without hops.

The leaves are of two kinds, *cordate*, or heart shaped in their young state, and *trilobed*—or three pointed in their older growth, with notched edges—(see the engraving). The under side of the leaf is of a lighter colour than the upper, having a different function to perform. (*Of the glutinous matter on the upper surface, see diseases of the Hop.*) The male hop does not in general throw out its lateral shoots, so far as the female, in which latter there will be at each joint, varying in length, one, two, or sometimes a complete bunch of hops according to the season; the joints may be one inch or they may be six inches from one another.

THE BLOSSOM, STROMBILE, AND FRUIT.

At about the end of July, the burr or blossom of the female shows itself as a small knob, the face of which is covered with the pointed stigma terminations of the petals; the base of the blossom has a calyx of six or eight green leaves, which become abortive petals; nearly each petal of this strombile flower is terminated with a divided stigma, each point being furnished with a glutinous matter to hold the farina from the male, and convey it to the germe of the seed at the base of the petal; the tip of this double termination, is of a different colour to the other part, and it remains in that state ten or fourteen days according to the weather, and its supply of male dust. If the impregnation takes place early after being in burr, the hop will form itself in a few days, but if it receives no impregnation, a male plant not being near, it lingers in the burr for many days, appearing to require a stimulus. The flower of the male is a calyx, five leaved, (see the engraving), the blossom being quite complete in July, when the female burrs are ready to receive the farina; about the middle of the day, the five swelling anthers burst, and the dust is wafted to the female burr, which appears to be pos-

sessed of an electric attraction ; probably, one part is in a positive, and the other in a negative state of electricity, and by this means they adhere together. Soon after the impregnation a change may be perceived, and it may be observed in the direction of the wind, from a male plant, that the hops are forwardest, and they will be ready for picking many days, before those that have not received any of the male farina. The engraving, of the female bloom, is taken *a week after it has received the impregnation.*

The nectarium of the hop is a material subject for discussion, because it is so little understood ; this is known amongst the growers as "*the condition of the hop,*" consisting of small globules of viscous matter, at the bottom of the petals and surrounding the seed. The object which nature had in view in the formation of this juice was, to supply nourishment for the completion of the seed after receiving the farina from the male ; this is the function of the nectarium in all flowers, and in general it is a sweet matter supplying the bees with honey, but in the instance of the hop, it is of a bitter taste. It has often been remarked, that where there is most seed, there is most of this dust or condition, (the material from which the lupuline is extracted,) and when dried, it is the dust which adheres to the hands. In some flowers the nectarium is not situated on the petals, but in this instance it is similar to the lily tribe, and is always near the germe of the seed. Further remarks will be found on this subject, under the head, *quality of the Hop.*

An observer of the vegetable kingdom, may often be delighted by the efforts which nature makes to produce its kind in seed, which efforts are often frustrated by the hand of man, for want of knowing the physiology of plants.

In a congenial year the strombile of the hop will grow out so luxuriantly as to be three inches in length, in those grounds which have been properly cultivated ; but where this has not been done, and it is an uncongenial season, they will scarcely exceed half

inch in length, and verify their term of mere buttons. The strombiles of fine hops, become, when ripe, of a square form with flat sides, terminated with a cone, like a sugar loaf.

When the hops are ripe, it may be observed that bees frequent them, and thrust their heads under the petals, and with their proboscis seem to extract a honey, wax or bee bread, from about the seed, and this will be observed more particularly in those healthy plants which are raised from seed.

On the subject of the sexual intercourse of the plants, it will be well to give an analytical definition, to shew more forcibly the truth of the position; for many planters will not now believe, or hear with any patience, this fundamental truth of nature, as if the ALL-WISE CREATOR, ever made things in vain.

To the observant agriculturist, to the practical and scientific gardener, or amateur florist, it would not be necessary to enforce, in more persuasive language, that the CREATIVE POWER of the ALMIGHTY has ordained that all vegetation shall consist of male and female parts; that, in general, the male and female are situated in the same flower, called *BISEXUAL* flowers, as in the wheat and grasses, which may be seen under the calyx or chaff, but more distinctly in the lily tribe of flowers; that another division of plants has two different blossoms, male and female, on the same root, called *MONGÆCIA* (one habitation), as the nut, the cucumber, and melon tribe, the Indian corn, the oak, the fir, and many other forest trees: the other division has its flowers on two distinct plants, called *DIGÆCIA* (two habitations) as the hop, now under our consideration; of the same class, there is the hemp, the spinach, the willow, the poplar, the date palm, the mistletoe, the yew tree, the juniper, &c.

Of this last class or division of the vegetable kingdom, it is as necessary that the male should be near the female when they blossom, as that male and female animals are necessarily connected for the procreation of offspring: that is, if the plant is required

to be made complete, and to produce seed that will grow.

The sexual hypothesis, when first introduced into the scientific world, was received with that caution which characterizes an enlightened age, as is now done by the hop-growers, and the subject was traced through all its ramifications, before it was universally assented to; but now it is so clear, that even the birth of animals, being the consequence of intercourse between the sexes, might be with as good ground doubted of; indeed, it is as ridiculous to doubt the one as the other, particularly if the arguments and facts are at all inquired into.

To have one established fact is better than many arguments; the following is given with that view, as it leads to conviction.

Extract of a letter from Professor Mylius, at Berlin, to Doctor Watson in London, dated February, 1750.

“ The sex of plants is very well confirmed by an experiment which has been made here on the palma major. There is a great tree of this kind in the garden of the Royal Academy; it has flowered and borne fruit these thirty years, but the fruit never ripened, and when planted it did not vegetate. The palm tree, as you know, is a *Diœcia* plant, that is, one of those in which the male and female parts of generation are upon different plants; we having no male plant, the flowers of our female were never impregnated with the farina of the male.

“ There is a male plant of this kind in a garden at Leipsic, twenty German miles from Berlin; we procured from thence in April 1749, a bunch of male flowers, and suspended them over our female ones, and our experiment succeeded so well that our palm tree produced more than 100 perfectly ripe fruit, from which we have had already eleven young palm trees. This experiment was repeated last year, and our palm tree bore above 2,000 ripe fruit. As I do not re-

member a like experiment, I think it convenient to mention it to you; if you think proper, be pleased to communicate it to the Royal Society."

The plant here mentioned is the *Phœnix*, of which a fabulous account is given, but it is known as the *Date Palm Tree of Africa*, it is of the *Triandria* order, the male flowers being furnished with three stamens. Where this tree is a native and flourishes, the hop plant is less known than the palm tree is in England.

The yew tree is of the same class, but of the order *Monadelphia*, that is, the male flowers have one set of united stamens; the juniper is of the same order; but these plants are very different to our hop, which, although it has a perennial root, the stem is only annual.

The fig, (*ficus*), is another subject of interest, and will bear on our subject of the sexes; indeed, it will explain the appearance of the hop without impregnation.

This plant is very varied in its blossom, some having the male and female in the same receptacle, and others in separate blooms and plants, but always within the fleshy part of the fig, class *Polygamia*. It has often been asked, how it is that the hop will form a seed, even when no male farina could have got to the blossom? This will be answered by the growth of the fig; and in the same way the form of a cucumber can be grown without the impregnation, but then it will be without fruitful seed. But how is it that the fig on our trees ripen, seeing that they are of one sex only, and have no assistance from the male? Now the fruit is in all cases to be distinguished from the seed contained within it; if the male be wanting, the seed will not vegetate when sown, but the fruit may nevertheless swell, and come to an appearance of perfection, as it is observed to do in the instance in question; although it is more common for the fruit to drop off before it ripens, if not fecundated by the male, as the cucumber is observed to do. Amongst hops, a high

wind, or a peculiar state of the weather, will occasion the abortive leaves to be blown away when they are ripe, whereas those leaves, with a seed at the bottom of them, are not so easily removed from their station; the hops which are so easily detached from their stalk, appear to expand their petals, and amongst the growers called "flyers."

By attentive examination, it will be seen that those hops which could not by any possibility be within reach of any male farina, will yet have all the appearance of seed at the bottom of some of the petals; probably two or more seeds may appear; upon tasting these they will be found to be very mild and not at all like the pungency of those that have been fecundated by male farina. Upon reflection, it would seem as if nature made great efforts to complete its kind, and throws all its energy in the strobile to make the external form of seed, if it could not give the germ of vitality.

The attentive, observant farmer, or hop grower, must be convinced of the truth of this process of nature, the datum is so good that it amounts to a demonstration; the gardeners will be convinced by their own practice, for their melons or cucumbers cannot be raised without assistance to the blossom at that early season of the year when insects are shut out of the forcing frame; nuptials being prevented where the winds do not blow, and hence stove-plants seldom produce energetic seed.

The amateur florist, who succeeds in raising new and fine sorts of geraniums, or dahlias, does it by taking the pollen of one fine flower to the female parts of another; and in the geranium (*pelagonium*) it is particularly noticeable, that in a few hours after the flowers of one plant are brought in contact with another, the petals fall off, the blooming being complete; whereas those flowers that have not received the impregnation will remain in flower for several days afterwards. There is another remarkable circumstance relative to this as well as many other flowers, that the male and

female parts of the same flower are not ripe together ; nature seems to have ordained that the flowers should cross and intermix ; if any flower is required to be kept in blossom for a longer time than usual, the best way is to cut off the male anthers as soon as they appear, that the pollen should not be shed over the female stigma.

Some persons may ask, of what service is it to obtain the hop plant by such a round-about way when they can be so readily obtained by cuttings ? and may also ask, what are the advantages of having male plants in the ground seeing that they do not yield fruit ? These questions will be more particularly answered in the course of this work, by the inferences that may be drawn from the facts enumerated, but for the present it may be well to remark, that the plants raised from seed are more healthy, more agreeable to nature ; from them more healthy cuttings may be obtained, such as would not canker off in a few years ; also, that one plant is sufficient to form a hill, and will grow the better, not having a partner in the same hole, contending for the best nourishment ; it will be shewn also, that one seedling plant has been made to produce $3\frac{1}{2}$ lbs. of dried hops, when only three years old ; that also those blossoms which have had plenty of the male farina shed over them, will have seed at the bottom of every regular petal, 45 seeds having been counted in one hop, where there was 70 petals ; (there will be, in nearly all hops, several blank leaves between the seat of the seed petals on the stalk ;) and that the seeds themselves are as heavy as the whole flower besides, is no little consideration in an article that is sold by weight, moreover they are the most pungent bitter of the whole flower.

CHAP. IV.

QUALITIES OF THE HOP, PREVIOUS TO AND AFTER THE DRYING.

The points to be taken as guides for the value of the hop in the estimation of the dealers and consumers, are—their *colour, scent, seed*, and the *glutinous* touch to the hands; some persons do not regard colour, but inquire into the pungency and quantity of seed. It will be well that we now inquire into these subjects, being tests which call into action the external senses of buyer and seller.

THE COLOUR OF HOPS.

This subject is a material point, for the growers, as well as the dealers, to be master of; for whilst the appearance will recommend an article for sale it must be attended to; it should therefore be understood, that an early picking, before they are bruised by the wind, is the only way to get a natural light green colour; but then the seed is not ripe, or even full, consequently much weight is lost. At Farnham, where the greatest care is taken in the picking early, a selection is made of those hops that are at all injured, and they are not suffered to go with the bulk; a naturally light green coloured sample is thus obtained without the aid of chemistry. This is one of the causes of the great price of these hops in comparison with others.

In those parts where the picking is later, and where they are suffered to hang until they are ripe and brown, the seed being then plump, it is usual to evaporate *sulphur*, by placing it near, or in the fire, the fumes of which will pass upwards, and through the layer of hops on the kiln, uniting with the brown part of the hops, which are thus restored, or bleached to their natural colour, or rather they are made thus chemically of a more delicate greenish yellow than

their original state ; indeed this usage takes off much of the greenish hue, and substitutes a brimstone yellow : the more sulphur that is used the more delicate will be the colour. At the Mallng show of hops a premium was given in the year 1832, for the best managed sample in the drying, that is, for the one where the most *sulphur* had been used.

By placing the hops that have been highly fumigated with sulphur in the open air, particularly in the sun, they will again return to their brown state; hence the Farnham hops, to which little or no sulphur has been used, are sought for pale ales, as the colour is not artificial, and can therefore be depended on not to injure the colour of the beer.

Sulphur burnt under a deep coloured flower, will change it to a white or yellow, and the liquid sulphur will receive some of the colouring matter of the flower ; this has been done under dahlias, and has given them a striped appearance, but the colour is not retained.

The drying hops with charcoal is likely to impart a green hue to them, particularly if the charcoal is damped ; this checks the rapid burning, and the hydrogen of the water unites with the carbonic acid of the coal, forming the green, these ingredients being the constituent parts of green leaves.

THE ODOUR OF HOPS.

The sense of smell will be gratified most by those hops where there has been the least sulphur used, and where there is the full quantity of seed ; this scent is easily distinguished from those that have been fumigated with sulphur ; for although the new hops at market have a high perfume, where sulphur has been used, yet it is very transient, the sulphur being so exceedingly volatile it passes readily away, and takes with it a portion of the aroma of the hop, hence a yearly reduction takes place in the weight and also in the quality.

A stout or thick-leaved hop is said to retain its

scent and weight for a longer period than the chaffy thin-leaved hop; a thick leaf is best obtained in the completion of the petal by means of a well impregnated seed.

The sense of smell is so exceedingly acute with some persons, that the good or bad quality, seed or no seed, sulphur or no sulphur, or any state in which hops may be in, can readily be distinguished; but it is the high or low drying, or the age of the hop, that is most attended to, with respect to the odour.

There is a gentleman in the Borough of Southwark, who has been brought up amongst hops, and is now living in the midst of the factors, whose sense of smell is so acute, that he cannot go into a hop warehouse without his olfactory nerves being much affected by the effluvia passing off from them; and he can tell somewhat of the age of the hop by the weakness of the scent, indeed a new, or highly pungent hop, is exceedingly painful to him.

The material then, which passes off from the hop, must be a portion of its substance, and consequently a diminution of its weight. Every one knows the effects of burning brimstone in a room; the same reduction, or change of form, takes place in evaporating it by a gentle heat; the matter passing off remains with the hop, under which it is evaporated, or goes into the surrounding air, for a part will pass away at the cowl of the kiln. However difficult it may be to ascertain the ponderosity of smell, still we can conceive, that when a weight of sulphur is put into a kiln near the fire, and it is all gone in the course of a few hours by the effect of heat only, that there is a weight in the odoriferous part of the hop, although we have not yet made an instrument to detect it. The infinite divisibility of matter, can indeed be scarcely conceived, and yet it can be proved to a demonstration that even light itself is material. A fox scenting a country for many miles, and detected by the acuteness of a dog; or the perfume of a grain of musk during many years, without a perceptible diminution of its substance, fully

show the infinite divisibility of matter, and consequently the divisibility of weight, or odour of hops.

The aroma of a full ripened hop is exceedingly grateful to some persons, and will give a tendency to sleep. The American Indians are said to have the acutest smell of any race of men, that they can hunt through the woods as a dog by the scent, and that they can distinguish an Englishman from a Spaniard by their smell; this probably arises from the constant exercise of this sense in tracing their enemies.

THE FLAVOUR OF HOPS.

The taste is so allied to smelling that they can hardly be defined separately, as of all articles which go into the mouth, the olfactory nerves take cognizance, and give liberty of entrance. But the tip of the tongue has such a nice sense of taste, that much may be ascertained relative to the quality of an article, by that ordeal. It has been said that different parts of the tongue, take cognizance of different flavours, that one part will convey the sense of acid, another of alkali, another of bitter, and so forth.

The sense of bitter in the hop, may be detected readily, by taking a seed that is fully ripe and properly impregnated; bite it, and bring it to the tip of the tongue, and in a few seconds a most pungent bitter will be tasted; not so, when the seed has not been impregnated; nor can it be tasted correctly when it has been fumigated with sulphur.

If the leaf be tasted apart from the seed, it is as chaff, with little pungency; nor has the dust at the bottom of the petal much bitter taste, although it is so highly prized by hop growers. A hop may have the outside form of seed, without vitality, consequently without the bitter, the seed then having a sweet taste: when this is the case, it may be decided that no impregnation has taken place.

THE FEELING IMPARTED BY HOPS.

This point of guidance to the quality of hops, can only be properly noticed in the field, for when they are dried and sulphured, but little of the original quality can be known by feeling. In the picking of the hop the quality is estimated by its clammy or sticky property; a portion of this property remains after the drying, but a still less after it has been kept for a year; it is the dried globules of viscous matter undisposed of by the seed; *!(see Blossom)*. When this dust is fully grown to a rich gold colour, the fruit, is considered to be ripe and fit to pick, and this is correct if the seeds have become hard and plump.

But the feeling excited by a sample of hops at market, must in some measure, be judged of, by the state of moisture they are kept in; for in the winter months they will imbibe from the atmosphere a considerable quantity of moisture, and will lose it again in the summer, if they are placed in a dry situation; but this quality of absorbing the humidity of the air, and the quantity, is regulated by the original drying of the article, a branch of the inquiry which will be considered more particularly under the head, "*Drying*."

WEIGHT OF HOPS.

This is much influenced at market, by the keeping, and the extent of drying; for if a slack heat be used, and they are not sufficiently dried, they will lose in the warehouse from 5 to 10lbs. in the cwt., and they will also be affected in weight by moist or dry weather; but the most essential point of weight is to be obtained in the garden, by botanical management.

If the picking be early the weight will be less than if left to be thoroughly ripe; about 80 bushels to the cwt. or 1½lb. to the bushel is calculated as the average weight of dried hops when they are bagged. This however will vary from local circumstances, and from the seasons from 60 to 100 bushels to the cwt.; but it is the existence or absence of seed which most

affects the weight; when there is plenty of seed, that is a seed well formed and plump at the bottom of every petal, then 3lb. may be obtained in a dried bushel, or from 40 to 70 bushels will weigh a hundred weight. To demonstrate this position, let a practical man take a small measure full of the seedy and dusty hops from the picker's binn, collected from around a male plant; and the like quantity from a part where there is no male plant; then compare the weights, and calculate a bushel or a cwt. therefrom; the result of this trial, if repeated, may lead to conviction in the mind of any reflecting person. An acre of hops will sometimes amount to 24 cwt. or more, but 10 cwt. is about the average crop. (*On this head see the tables of districts and weight per acre.*)

The weight of hops is also in some measure affected by the practices of bagging sooner or later after the drying; in some parts they remain many days before they are packed, and in others they are put up when they are warm from the kiln, in which state they increase much in weight when they are in bags.—(*See the practice of Drying and Bagging.*)

A bag of hops will weigh about $2\frac{1}{2}$ cwt., and a Kent pocket about half that weight; but at Farnham, they are all packed in fine pockets or bags which will weigh from 2 cwt. to $2\frac{1}{2}$ cwt. each. If they are not sufficiently dried, they will shrink and lose weight, and thus admit air into the bags.

To show the fluctuation in the produce of an acre of hops, it may be here stated, that at Binstead, Hants, a farmer grew $4\frac{1}{2}$ cwt. on 10 acres in the year 1825, and in the following year the same land produced nine tons!! It has often been remarked that those grounds which have had a failing crop one year, are most likely to have a good crop the following year; the ground apparently treasuring its resources.

CHAP. V.

DISEASES OF THE HOP PLANT; AND THE
ATTACKS IT UNDERGOES FROM INSECTS,
AND PARASITICAL PLANTS.

Of actual disorder in the plant itself, when raised from seed, it has none; the plants raised from cuttings, of an old decayed stem, become disordered, canker off at the surface of the ground, or die altogether; this subject has been discarded on, under the head of raising the plants; we have now to consider the attacks on the plant.

The blights, and casualties which this plant has to undergo before it arrives at perfection in the strombel, are thought by some persons to belong exclusively to the hop; but it is not so, for there are few troubles they sustain, which other plants are not equally liable to. The insects, as well as the vegetable blight, or mould, affects in like manner the rose bush, the bramble, the apple, the willow, the vine, the oak, the hazle, and many other plants.

WIRE WORM IN THE ROOTS.

The first attack of insects in the spring of the year, is to be found in the decayed roots; this decay is often attributed to the wire-worm, (*Scolopendra*) or centipedes, but these in fact are not the cause of the defect, they merely take possession of the rotten wood, as any other insect might do, for an habitation.

The *Scolopendra* species, order aptera of insects, always inhabit rotten portions of wood, agreeable to the habits of their race; there are two or three varieties, which exist in the old stumps, some of a dark brown colour, with two antennæ, others of a lighter colour having red spots on each side of the body; they all have as many pairs of legs as there are joints in the body—from thirty to fifty. They have been called centipedes, but improperly so, for this term

implies 100 legs, some appear to have a double set on each side, they are from $\frac{1}{2}$ inch to 1 inch long, but are found in warm countries four or six inches long, inhabiting either rotten wood or moist places; they do not undergo the changes of winged insects, and when young, have a fewer number of feet than when grown older. There is another insect which attacks the hop root called *Hepialus Humuli*, but of which little is known.

These attacks of the root by insects is an additional argument for the propriety of raising plants from seed, that the roots may be healthy, and have no rotten parts; for it is fair to argue that the attack on the roots accelerates the total decay of the plant.

There are some entomologists, who assert, that attacks on the upper part of plants, are an index of defects in the roots; the most diseased plants of all kinds are most infected with insects on the leaf and branches.

HALTICA INSECT—THE BOB OR FLEA.

The next insect which attacks the hop, is on the leaf, and is of the same species, as the turnip fly—*Haltica nemorum*, (see the engraving); but this variety has the wing cases of a dark bronze colour, without the white marks on the wing cases, as the turnip fly, it is the *Haltica concinna*, known by various names in different parts of the country, as the flea, the jumping bob, the black jack.

This insect is of the Coleoptera order, having wings, and wing cases, as other beetles, with two pair of jaws; the hinder legs, or thighs are exceedingly muscular, by which means they are enabled to jump a considerable distance; the larva of this beetle is not yet sufficiently known to enable us to give a description, but it is presumed to have habits similar to other beetles, depositing its eggs in the ground, to come forth the next spring near where it had run its race the preceding year. It would appear that they are long lived insects, as there are several breeds of them

in the course of a year, for they may be observed on the hop leaves at a very early period of their growth, when not two feet out of ground, and may be seen on the plant until the hop is completed. They perforate the leaf to a complete piece of net work, leaving the strongest fibres; they also, often times do great injury to the young hops themselves, eating away the petals, and are most destructive in a continued hot season; there are many varieties of them, one particularly attacks the birch leaves.

The changes which these insects undergo are all of a similar character; unlike the Aptera order before noticed, which suffer no transformation, these undergo metamorphosis from the egg—(*Ovum*) to the caterpillar, or maggot, (*Larva*), then into the chrysalis, (*Pupa*), and lastly into the fly, beetle, or perfect state, (*Imago*) in which state they enjoy the pleasures of existence, nuptials take place, they produce their kind, and die.

The Entomological Society of London, offered a reward in the year 1835 for information, and specimens of the various stages of the *Haltica nemorum*, but no satisfactory account was rendered, nor was any light thrown on the hiding places of the Hop haltica.

OF THE APHIS.

Fly and Lice—Aphis humuli—Linn.

This species of insect belongs to the order *Hemiptera*, having their wings half crustaceous and half membranaceous, not divided, but incumbent upon each other. When it is understood that there are seventy-three species of these insects, and that each has a peculiar vegetable on which it generally subsists, an extensive view of this order of nature will be conveyed. It must also be understood that the natural history of insects imparts the fact, that the same vital principle will exist in various forms, and take different sorts of food in those forms; for the caterpillars and maggots which come forth from eggs, take a food which in their transformed state of fly, butterfly, or

moth they would refuse ; in their *Larva* state they are indeed generally very voracious, but in their *Imago* state they are satisfied with the lightest and most delicate nutriment.

In this same point of view, the aphid must be considered, and is known by the trivial names of plant louse, vine fletcher, and hop fly ; the varieties being named from the plants on which they feed, as, the aphid *rosæ*, &c. The first fly has four wings, erect, longer than the body, two antennæ or feelers, the belly ending with two horns, from which it is said a juice is emitted. This insect is known on many plants—as the Dolphin on the beans and peas ; that which exists on the rose is green, and of a large size ; on the elder it is nearly black, with three light stripes on each side of the body ; on the dock leaf and some other weeds it is quite black : those on the beans are nearly black, and those on the pea haulm are green ; these colours appertain to the winged fly, as well as the wingless progeny.

The first appearance of this blighter, this barometer of poverty ! is on the young shoots and leaves of the hop, before the leaves are expanded ; at that time, the long winged fly is depositing her eggs on the under side of the leaf ; in a few days the leaf is expanded to its full size, and then it is lined on the under side, with the progeny of the fly in the shape of eggs and lice ; in the latter state they produce offspring in a viviparous manner, bringing forth alive without further connection ; their impregnation being said to last and extend its productiveness for several generations :—so we are informed by Leeuwenhauk, who examined them attentively with his powerful microscope. After having run their race as lice, they again produce males and females, and eggs are laid in the season, from their intercourse, to be ready for the next spring vegetation.

Bonnet, in his account of these insects, informs us that the lice have two antennæ before, and two horns behind immovable, through which they emit the sweet

juice called *Honey dew* ; and this account has been copied by several writers on the subject, who have alleged these little creatures to be the plasterers of a juice, from their own bodies upon the upper side of the leaves which they inhabit ; but this position admits of very serious doubts, and will now be inquired into. Bonnet also describes them as having a trunk-like snout, with which they penetrate the leaves for their juice, but always on the under side : in some varieties, the horns behind are wanting, but there are small knobs which answer the same purpose.

Reaumur has described the horns of the Aphides for the same purpose of emitting a juice, and that those aphides which have wings do not indicate the sexes.

That these winged insects are the precursors of the lice does not admit of a doubt ; by a close examination they will be found to have the two horns behind, they have six legs, two horns before, issuing from a black head, a black back, a green abdomen or hind part, and the two wings are three times as long as the whole body : this is the appearance of the *Aphis humuli* at its first approach, and also at its quitting the hop leaves.

Bonnet and other writers on the subject assert, that from one egg laid in the spring there will be ten or more generations produced in the course of a few weeks without any additional amatory intercourse, and that ten millions are not too much to compute as the produce from one fly during the summer : they change their skins several times, which may be seen attached to the leaves. It does not appear that they eat any portion of the leaf, but only live on the sap juices, preventing its return to the earth ; for if the leaf is taken from the bine, these insects soon die. Mr. White, in his Selbourne, mentions a flight of aphides on the first of August, having alighted on the trees and plants in such numbers as to blacken them, and says, " these armies, no doubt, were in a state of emigration, shifting their quarters perhaps

from Kent and Sussex to Farnham and Alton." These hop flies appear principally in the hot period of June. The fecundity of this insect is truly incalculable, a thousand may be counted on one leaf, and supposing a plant contain 1,000 leaves, the plant may have to support and give nourishment from its juices to a million of aphides; small as the insect is, yet so great a number would lead us to expect the total destruction of the plant, hence no wonder at the black appearance of the leaves after being thus infected. M. Reaumur proved by experiment that one aphid may be the progenitor of 5,904,900,000 descendents in one year, presuming there may be twenty generations, their peculiar fecundity being different from all known similes, viviparous at one time, and oviparous at another.

Cause and Cure of the Aphides.—This indeed is a difficult subject; to offer explanations will be only groping about in the dark, for we have no data to commence with; but some hints may be thrown out in general terms for other observers to build upon. That the season is the great invigorator of animal as well as vegetable life there can be no doubt; and that the sun is the chief mover of the molecules of animals, and of the germe of vegetables in the spring, no one will attempt to deny.

Now, in the year 1836, the hops were nearly free from the aphides, and particularly the district of Farnham, the spring was exceedingly cold and wet throughout March, April, and May, and most uncongenial for the existence of the aphid fly. The year 1835 was exceedingly hot in the spring, and indeed throughout the year, and there was much fly on the hops in the early part of their growth. In the spring of 1834 the hops were much infected with the fly, so much so that the duty was calculated only at 60,000l.; the attack was early, but before the hops had thrown out much of their lateral shoots there occurred much electricity in the air and much thunder, and shortly after the insects were all gone; the hops

then threw out additional shoots, came successfully into hop, and paid old duty, more than 189,000*l*.

It is therefore the seasons we must look to, as the principal cause of this visitation of the fly, and to bear in mind that those plants will be the safest that are the most healthy.

When once the leaves of hops are infected by aphides, it is almost useless to attempt a cure ; but some observations may be made towards pointing out means of destruction. At all times it is better to prevent than to cure a disorder ; hence it will be a desideratum to find out the hiding places of the insects, as they are brought forth, produce their kind, and die on the hop plant, the last brood only slipping their skins and becoming the winged aphides, flying to some other habitation, where it is most likely they deposit their eggs. Some of this order of insects will make punctures in the bark of trees, in which they deposit their eggs ; others will penetrate into the ground, and put them beyond injury by frosts ; but wherever it may be that these aphides place their eggs, it is not far from the place where the young progeny of the next year are to receive their first nourishment ; and this is most likely to be in the surrounding hedges of a hop garden, for it is on the outsides where their first attacks commence. If these insects penetrate the earth for a winter habitation, the best mode of destroying them will be by tillage of the surface—by making a winter fallow ; if they penetrate the root, exposure to the weather will be one of the means of destruction ; and should they pierce the old bine, the best way will be to burn it on the ground.

Means have been tried, and sometimes with good effect, to destroy them in the progress of their growth, by fires and fumigating with sulphur and tobacco, which, when burnt immediately under them, is sure to occasion their destruction : this is done with great success in gardens, orchards, and green houses. It is always in small inclosures that the aphides most abound, but in large tracts of hops it is first observed on the outsides, hence it is fair to presume they come

from the hedges, from woods, and are driven by a peculiar wind up a valley to the hop gardens.

White, in his History of Selbourne, describes a flight of them alighting on the trees and hedges about his village in the year 1787 ; he also describes the winged aphid as able to destroy spiders much larger than itself, which he witnessed : from this we might argue that the insect in its winged state does not live on the hop leaf, but on other insects : this deserves inquiry. At any rate they are observed to follow a peculiar state of the weather ; heat and a certain wind will bring them forth, as electricity in the air appears to clear them off. The first winged aphides which appear are supposed to exist on the leaves about ten or fourteen days, leaving their progeny in myriads.

The male hop being the most forward is often first attacked ; on these they may be destroyed by the fumigation above described ; or fires may be made on that side of the ground where the wind blows from, and in the fire may be put damaged tobacco and some sulphur, which may have the effect of keeping them away, should there have been symptoms of their commencing an attack. Some persons have used a jet pump or garden engine to wash the plants in their early growth with some strong infusion of tobacco, or other noxious article ; stripping off the lower leaves also is resorted to, but this should not be done whilst they are in a green state, as they are the lungs of the plant.

A variety of this aphid fly may be observed on the Swedish turnip when in a forward state, particularly in a dry season, and when mildew has commenced on the leaf ; this variety do not confine themselves to the underside of the leaf, as in the hop, but appear rather to prefer the upper side.

OF THE HONEY DEW.

The strange notion is entertained, that this matter is the excrement of aphides when in reality it is a disease of the vegetable occasioned by their attacks,

though not in the way generally supposed ; indeed it is ridiculous to assert that the whole surface of the leaf can be so simultaneously covered with the excrementitious matter from the hinder horns of the aphides, as is the generally-received opinion. Bonnet has asserted that the juice emitted by this vine fretter, plasters over the upper side of the leaf, and this idea has been taken up by all writers on entymology since his time, without examining, or reflecting on the subject ; that they do emit a juice there is no doubt, for all insects must emit part of the material taken in by the mouth ; but that they are not the plasterers of the upper surface of the leaf will be now demonstrated as far as argument can do so. Paper may have been put on the upper surface of a leaf and may have received some of the excrement of the insects above it, will not be denied, for this forms the ground work of the opinion above expressed ; but how comes it that other leaves beyond, and above the insects, are also covered with the honey dew, for this is the fact ?

Shortly after the under side of the hop leaf has been attacked by the aphides, the upper side becomes blackened by the vegetable viscous matter emitted through the upper pores of the leaf ; this juice or sap, uniting with the oxygen and carbon of the air, gives the black appearance, arising from the *honey dew* ; the flow of sap has been treated of under the head Physiology of the Plant ; but here it may be proper to remark, that there are two distinct sets of vessels for the upper and under side of leaves, (except in the fleshy upright leaves, as in the *Cactus* tribe of plants) ; that if the exercise of the lungs of the under side of a leaf is deranged by the sucking of the juices by the aphides, then the upper side has to perform some portion of the office, and thus the whole is deranged, and thus we have a diseased upper surface. As the diseased lungs of animals become carbonized, so do those of vegetables ; indeed there are many attacks on the human frame, which may be assimilated to that of the vegetable ; many are the attacks, both mental

as well as physical, which create a perspiration on the surface of the skin, as do those of aphides on the upper side of leaves.

Honey dew will often be found on the most luxuriant growing plants, hanging as drops on the points of the leaves, whilst those in inferior soils growing less luxuriantly will be free from this perspiration on the upper surface of the leaves; an uncongenial state of the atmosphere and unhealthiness of the plant (such as growing too grossly) will sometimes occasion this disease, but in general it is observed on those leaves which are, or have been, attacked by the aphides; these injure the circulation of the sap, disorder the lungs of leaves, and occasion the black particles of matter floating in the air to attach themselves to the upper surface, particularly in the neighbourhood of smoke, as near a town, similar to the perspiration on man's body, which becomes blackened by exposure to the air. This blackness will also attach itself to the hop itself, and where the leaves are thus diseased the hops cannot grow out to their full size, particularly if the attack of aphides is near the blooming season. The hop with the leaves partakes of the same unhealthiness and are surfeited.

Professors are so apt to write from, and copy other men's observations, and to take them as their own, that it is no wonder the idea has been so long in vogue of excrementitious matter from the tails of aphides being the cause of sweat on the upper side of the leaves of those vegetables punctured on the under side by them.

The oak-leaves at certain seasons have a shining matter on the upper surface, a honey-dew, if you like so to name it; this sticky matter is the sap of the tree driven out by attacks of insects and cryptogamic plants—fungi and lichens—which live on the under surface of oak leaves; the effects may be seen in autumn by the brown spots on oak and other leaves. The punctures made by insects on the principal veins of oak leaves are shewn by the nut-galls, oak apples,

and other excrescences. The galls of commerce are from warm countries, where insects (*the Cynips*) attack the oak leaves in great numbers and with great effect. A round fungus also attacks the under side of oak leaves; it is of a bright brown colour, and occasions the honey-dew on the upper side of the leaf, is covered with apparent hairs, and when ripe falls under the trees, and is like unto parsnip seed. The beech leaf in the autumn is often covered on the upper side by this viscous juice; surely this is not the excrementitious matter from the horns of the aphides? Mr. White says, "The reason of this seems to be that in hot days the effluvia of flowers is drawn up by a brisk evaporation, and then in the night falls with the dews with which it is entangled; this clammy substance is very grateful to bees, who gather it with great assiduity, but it is injurious to the trees on which it happens to fall by stopping the pores of the leaves. The greatest quantity falls in still, close weather, because winds disperse it, and copious dews dilute it and prevent its effects; it falls most in hazy, warm weather.

OF THE LADY-BIRD, COCCINELLA, NEGER, BLACK-JACK, OR SHRIMP-GRUB.

Soon after the first appearance of the aphid fly, the Lady-bird appears, this is an hemispherical scarabæus, order coleoptera; the elytra is margined, and has various numbers of black spots; the abdomen is flat. The seven spotted lady-bird is the most common, *coccinella septempunctata*.

This coccinella, soon after its appearance, lays a bunch of about 20 yellow eggs on the hop-leaves; in about seven days these eggs are hatched by the warmth of the weather into a larva, or caterpillar, known as the negger, from its blackness, and lion from its voracity; these soon commence an attack on the aphid lice, which they devour in prodigious numbers, and grow to their full size in a few days. This creature has six legs in the fore part of its length, the hinder part having the appearance of a lizard's tail;

it is scored transversely over its surfare, giving the forms of spines or short tubercles, with the same number of yellow spots as there are black ones in its parent, the body being a dark brown. At the time of the aphides undergoing a change, this larva changes its form, by fixing its hinder part to a leaf, or the pole of the hop, slips its skin, which it leaves behind, and becomes a red seven-spotted lady-bird, winging its way to another habitation and another sort of food. This is the principal antidote to the aphid insect, and although the larva devours many, yet it is but trifling to the quantity of the supply. It would appear that the same weather which brings this coccinella to life in the spring, also brings forth the aphides, for they are seen in numbers together. In the year 1836, when there were no aphides to be seen at Farnham, there were no coccinella. This variety of insects, of the coleoptera order, has been known to remove in flights over a district of country; a few years ago, a flight of them alighted on the people at a watering-place on the southern coast of England.

The diseases of the hop, and other vegetables, whether occasioned by insects, or a cryptogamous vegetable, are commonly called blights; but there is not a more vague term, for it is intended to convey some idea of a wonderful state of the atmosphere; gloomy weather is called a blight in the air. A question is asked, "Do you think there will be rain?" "No, it is only a blight in the air," is oftentimes the answer; thus an idea is given of something generated in the air.

THE EAR-WIG.—FORFICULÆ.

This insect often attacks the leaf, at the period of the hop coming into burr, but generally at the top of the pole; their devastations may be known by the large holes which they perforate in the leaf; further they do no damage, therefore it is not necessary to dwell on their history; they are of the order Coleoptera, having a pair of wings covered with elytra, but

they do not use these wings, except on particular occasions ; they run very fast, and on this they depend, to avoid injury ; they are harmless insects, except in their destruction of the petals of flowers, of some of which they are particularly fond.

CATERPILLAR OF MOTHS.—PHALENÆ.

These are known to attack the root of hops, particularly the caterpillar of the ghost moth, (*Hepialus Humili*) ; there are many hundred species of moths, all belonging to the genus, *Phalenæ*. Of the varieties known in England, it should occasion no great surprise, that some of them are found in hop-grounds ; their larva, or caterpillar, feed on various plants, and from some one or other of these the bine of hops gets eaten off just under the surface of the earth, which happens at various stages of the growth, from the bine first getting up the pole, until the hop is ripening. At the picking season some of these caterpillars are seen, with long hairs on the body of a yellow colour, and dark spots, and are locally called hop-dogs ; some of these varieties change into a chrysalis in June and July, and into the fly in August and September.

OF THE MOULD, MILDEW, OR FEN IN THE HOP.

This disorder of the hop is of the vegetable class ; we have hitherto been considering the animal attacks on the plant, now we will endeavour to throw some light on this appalling complaint, which has baffled hitherto the attempts of the growers to destroy, or even many of them to understand of what it consists. In this again, we must observe, that it is easier to prevent than to cure a disorder which has commenced, for it is an acknowledged axiom, that the first step to all curative processes is to know the causes, with these therefore we will commence.

It is a favourite principle with some persons to say that such a thing comes by chance, that a vegetable is brought forth by the nature of the soil without seed—that insects are bred in the air—come by the

wind—or by a moist atmosphere they are poured down upon us from the heavens ; but all this is nearly exploded by reflecting men. In a letter written by Dr. Walker to Lord Kames, in the year 1776, there is a passage which bears on the subject now under consideration, which we will quote, in hopes to set the false doctrine at rest.

“ The doctrine of *equivocal generation* was universally admitted till about 130 years ago, but not so much by the ancients, as by the half enlightened moderns before that period ; much longer it could not well continue, as it is a doctrine that can subsist only where human knowledge and understanding are but in a glimmering state.

“ In this state, philosophers saw mites generated from rotten cheese, and myriads of flies and creeping things arise from a dung-hill, or a putrid marsh. Ignorant of the natural history and generation of these animals what could they do, but to conclude them to be mere spontaneous productions, and the effects not of generation but of corruption ?

“ To add to their foolery, the degrading doctrine never was extended to a lion or a horse, but confined to the poor insects, merely because they were creatures of whose nature they were ignorant. They knew not that the same power and wisdom were necessary to form a maggot that are required to produce an elephant.

“ The same conclusion, however, they always formed concerning many vegetables, whose seeds escaped their eyes, such as the ferns, mushrooms, and mosses ; because they saw no seed in such vegetables, they asserted they had none ; and while the oak and the laurel were dignified with generative faculties, these plants were vilified as the progeny of putridity. *Equivocal generation* thus became the asylum of their ignorance.

“ That seeds should withstand the powers of animal digestion, which no other vegetable substances can, and which they are also unable to do when once they

are broken, is to me a miracle in nature; and is such a provision for the preservation and dissemination of seeds, as I cannot look upon without wonder.

"Thus much for the propagation of plants; any other method, except by seeds, suckers, and layers, appears to me both unknown and unnecessary, and so farewell to equivocal generation. I can scarce write on it without being a little ruffled, so ill does it accord with nature's complete design in the creation."

The mould, then, must be considered as a vegetable, propagated by seed, like other vegetables. It is a fungus of the same class and order as the mushroom, Cryptogamia class, fungi order, mucor, genera, of Linnæus. There are 17 varieties of mould known in England. The one now under consideration, when perfectly grown and highly magnified, has the appearance of a crop of grass, with bladder like heads on foot stalks, and in some it is like wool. That the mould yields a seed may be evidenced by the part first infected inoculating in a few days the leaves and blossom around it, and by the seed being washed down into the ground, wherever a bunch of bine (that has been affected by it) is laid. Some varieties of mould flourish in dry weather, others in moist; in the autumn, early sown turnips are often much covered with it; like the infection of the aphides, the outsides of hop-ground, particularly when they are enclosed with high trees, or hedges, are most troubled with mould; that it will infect a hop-ground for many years in succession, is very well known, and occasions the grubbing up of many an acre.

The commencement of the mould is seen by a small speck on the leaf; this increases with its growth, yields a germ which is disseminated, and is soon seen in spots on the blossom as well as the leaves, and when once it attacks the burr no further progress can be made in maturing the hop; it is complete destruction. Humid weather appears to increase the mould, and when a hot season occurs very little is ever seen.

At Farnham, the eastern side of a large track of plantation is most generally the first infected, in a season liable to bring forth the mould; this side of the town is exposed to the draught of air from the woody vallies on each side of the hog's-back ridge of chalk.

The seeds or spawn of mould may be seen in the ground beneath where diseased hop bine has been laid for a few weeks after the hopping; the mould may also be seen in the dry banks under hedges, particularly near a ground liable to be infected with mould; it may therefore be considered like unto mushroom spawn, and treated as such; it will grow wherever you put it, in congenial weather, the more manure the more fungi and mucor there is likely to be. The decayed matter of leaves is generally fruitful of these vegetable varieties, hence the propriety of having thin and well-cultivated hedges around hop-grounds, that there may be as little encouragement for insects and mould as possible.

This disorder once commenced there is no remedy, except what nature affords by the weather, as a preventive to the increase. To overcome this, as well as other attacks, the best way is to have healthy plants from seed which will overcome slight infections, unhealthy plants will suffer the most from this disorder; tillage of the ground, an open aspect to the east, south, and west, with a congenial soil, and then there is not much to fear from the mould. But should it have troubled a crop, the bine ought to be burnt as soon as possible, even to the loss of the few hops which may be thereon; if an infected bine is laid on the ground, it will soon send forth seed, and the humidity of morning and evening will carry them throughout the ground, inoculating the adjoining portions. Some persons have considered that a manuring with rags and fresh stable dung will bring forth the mould, and it may make the plant unhealthy, and prone to catch any disorder.

OF THE MILDEW.

This is another variety of the Cryptogamic parasitical plants, which infest the hop leaves; it is propagated by seeds, like the last we considered, which float in the air, similar to those of mosses and lichens, and find food on the bark of trees, dead fences or plain stones. The seeds of mildew, falling on the diseased leaves of plants, there find a nourishment, and injure or destroy the foster parents, the hop or turnip leaves. This infection generally follows the want of nourishment to plants; early turnips, or late peas, may be observed covered with the white mildew.

Stripping the leaves from hops, is often resorted to, to remedy any animal or vegetable infection, this is done as high as can be reached, but it is a dangerous operation for the growth of the plant, the leaves being the breathing places; when the lower leaves of hops are shrivelled up, being unhealthy, wanting nourishment, or as it is called, *fire blasted*—then the leaves may with propriety be stripped off, but only those that are thus dead—the leaves are the only means of keeping up a circulation of the food taken in by the roots. As a proof of the use of the leaves, let two vigorous growing vines be cut off at twelve inches from the ground, and the ends of each immersed in a glass bottle containing equal quantities of water, if one of the vines be stripped of its leaves, the result will be that one will imbibe the water from the bottle in a copious manner, and the other will scarcely drink at all. A plant with the leaves on, will drink four ounces of water in this manner, in twelve hours, when in the shade of other plants; but, if exposed to the sun, it would drink much more of the water, hence the necessity of admitting plenty of light and air between the rows.

The disease of *fire blast* arises from the want of sufficient nourishment in the root, the whole supply of sap juice being required to complete the growth of the hops on the top of the pole, but little can return to

the lower leaves, this is particularly observable on those hills which have too long a pole put to them, the principal growth being at the top of the pole, and is most observed when the hops are ripening.

CHAP. VI.

CHEMICAL AND SCIENTIFIC OBSERVATIONS ON THE GROWTH AND PRESERVATION OF PLANTS.

In opening an inquiry into the principles of vegetable growth and of the aroma and pungency of the hop, it will be necessary to have recourse to scientific terms, to make the subject clear to the general reader, the practical man will therefore be pleased to excuse the substitution of those for such as are more commonly used.

The grand objects in the growth of hops, are to obtain the bitter principle, with great weight, and bright colour, we must therefore inquire of what they consist. We have observed, in the "Medicinal qualities" that the aroma resides in a volatile oil, and the astringency in a species of tannin. The astringent quality of all bitters, is combined with the tannin properties of all vegetables, gallic acid being the principal ingredient; but the acid, and the astringent principle are known to be distinct matters, although generally in combination in vegetables. The tan will purify oils and combine with noxious matters; acetate of lead will precipitate the bitter principle out of a liquid when in a simple state, as in beer.

The decomposition of all vegetables yields potash and carbon; and these ingredients, added to a soil, deficient in them, is always found to give stimulus to vegetable growths; animal and vegetable matters, yield them in great quantities, and their decomposi-

tion is effected by the union of oxygen from air and water with their substances, and forms a soluble matter to be united with other ingredients to form the food of all vegetables; thus a heap of leaves which consist of potash and carbon, are rotted by the action of air and water, and forms carbonic acid gas, which with sub-carbonate of potash are the principal food of plants. Oxygen also unites with metallic matters and has something to do in the formation of flavor and colour; carbon tends to form the blue, and hydrogen the yellow; these matters combined forms the green of vegetables.

The electricity of the air, is a subject, generally lost sight of, in considering vegetable growths, although it plays a considerable part, in giving luxuriance thereto. The electric fluid always pervades the air, by night and by day, in the sunshine and in the most cloudy weather. The magnetic fluid, which is proved to be a variety of the electric matter, is always found to be more or less attached to the metallic matters and oxides of the earth, hence on the surface and under the surface, the electric fluid may be excited. And here arises the question how far the magnetic, or electric fluid of the earth pervades the sap of vegetables in its flow from the earth to the extremity of the leaves, and thus charging the air, from the earth with electric matter; it may be this fluid which occasions the rapid flow of sap in warm weather, as is evidenced by the growth of hop bine—three inches in twelve hours. But this we do know, that growing vegetables convey a certain portion of electricity, in the air, silently to the ground, as is proved by a plant, placed in a room where an electrifying machine is excited, carrying off the electric fluid from the machine, if near the striking points, and will prevent a jar being charged.

It is a well received opinion amongst philosophers, that a deficient quantity of electricity in the air, is injurious to the growth of vegetables, and propositions have been made to entice the fluid from the upper

regions. For the increase of this flow of matter, to the hop plant, it has been suggested, they should be poled with iron rods pointed, to attract the fluid, and thus give vigour to their growth. A myrtle has been electrified daily, and grown ten times faster, than one that had not been so operated upon. Warmth increases electricity in the air.

The *bitter principle* in hop is found to be astringent, in various degrees in different parts of the plant, according to the following order. The seed when impregnated with the male farina, contains the largest proportion, in combination with an aromatic oil; then, the chaffy petal, with the dried dusty nectarium matter; then, the stalk,—the leaves,—the bine. These qualities are evident to the taste, when bitter; but they are more particularly so, when boiled with equal quantities of water, and equal weights of each article; this would also seem to prove the impropriety of taking the stalk from the hop, particularly in scarce years, when even the lateral shoots with their leaves might be used for bittering beer. The difference of bitter principle in the stalk, will be evident by comparison and taste of those which have, and those which have not, had ripened full seeds on them, the bulk and the weight will be as four to one.

Relative to bittering beer with hop leaves only, the reader is referred to the extract from the curious old work, quoted at the end of this essay, which says, that in the year 1566, “small hop leaves were sold in Flanders at twenty-six shillings and eight pence per hundred pound, without one hop being mingled therewith”—this is about the price, the hops themselves sold for at that period.

It is a mystery in nature, and perhaps ever will remain so, as to what process takes place in the different vegetables, so, that of plants growing in the same ground, manured with the same matters, and watered the same, one will be the bitter hop and close beside it the sweet green gauge will flourish, the hot *mustard*, *capsicomb*, or *chili*, and near them the cool

cucumber, houseleek, or asparagus. One flower will be fragrant, as a *violet* or *jasmine*, and another will be noxious, as the *ARUM* (Wake Robin, or *Phallus fætidus*) stink horns, (*uredo fætida*, smut balls in wheat.) The nature of the vital principle in the plant can be the only matter of conjecture as to these phenomena.

The principle of organic changes in matter is prettily exemplified in *St. Pierre's Studies of Nature*. "The sluggish cow pastures in the cavity of the valley, the bounding sheep on the declivity of the hill; the scrambling goat browses among the shrubs of the rock; the duck feeds on the water plants of the river; the hen, with attentive eye, picks up every grain that is scattered and lost in the field; the pigeon, of rapid wing, collects a similar tribute from the refuse of the grove; and the frugal bee, turns to account even the small dust on the flower: there is no corner of the earth where the whole vegetable crop may not be reaped. Those plants which are rejected by one are a delicacy to another, and even among the finny tribes contribute to their fatness. The hog devours the horse tail and henbane, the goat the thistle and the hemlock. All return in the evening to the habitations of man, with murmurs, with bleatings, with cries of joy, bringing back to him the delicious tributes of innumerable plants, transformed, by a process the most inconceivable, into honey, milk, butter, eggs, and cream."

In the bitter principle which we have been considering, it is supposed that nitric acid with indigo, constitutes the substance; and that the odour is given out from the oil, which is very volatile; this oleaginous perfume from the hop, particularly of the seed, consists of carbon, hydrogen, and oxygen, in proportions not yet ascertained.

The position that the decomposition of one article is calculated for the reformation of the same, is a principle which has never been gainsaid; the matters from a hop ground should be returned to it, in all

possible ways, the bine after being trodden into manure, the cuttings after being eaten by cattle, and the hops after being used at the breweries,—with this view the manure has been made, as advertised at the end of this work. If the bine cannot be readily reduced, it may be so done with quick lime, and thus converted into a manure. The refuse yeast from brewers should be returned to the land, as an active manure, it being carbonic acid in a liquid form. This gas may be collected from the surface of all fermented liquors, and obtained readily by a mixture of chalk and water with sulphuric, or muriatic acid; and this will be a test for any soil to ascertain the quantity of carbonate of lime contained therein. It has often been a subject of regret amongst scientific men, that so much valuable manure should be lost in the great breweries in London, the quantity of carbonic acid gas, perpetually escaping from the vats has been hitherto lost, as well as the waste yeast; these are now collected, and concentrated into a manure, with the refuse hops to be returned to the hop grounds.

A dressing with yeast has been tried on several kinds of vegetables by Mr. Birnie, a brewer at Frimley, with most beneficial effects, and there is no doubt as to its capability of giving a stimulus to the growth of hops.

As every animal will continue its kind, so will every vegetable give stimulus to its kind; and this position is advanced on practical experience, in opposition to the mistaken notion that every plant gives out excrementitious matter, which is poisonous to similar or the like vegetables, as advanced by a professor, and published as a guide to learners.

The comparison of animal to vegetable life has often been made, but their points of agreement have seldom been defined. By some persons the vegetable has been called a continuation of the animal kingdom. That they, in common, have life,—that they feed and have feeling,—will be evident to every one; but the division of the two kingdoms is not so easy to define.

To the author of this inquiry it appears, that the principal point of their agreement is in the circulation of the blood in animals, and the circulation of sap in vegetables.

If the principle laid down by Mr. Hill, after a close examination and experimental inquiry, pursued at the King's Garden at Kew, and a continued practical examination of the subject by the author for 20 years, be correct, it is fair to argue and assert, that this is the chief link of similarity, viz. that there are two sets of vessels in vegetables, one for taking the sap up to the extremity of the branches and leaves, and another to return it to the earth, after performing its duty at the extremities; as there are arteries and veins in animals for the like purposes. Also, that the leaves act as lungs to vegetables; the sap, there meeting with the atmospheric air, is recomposed, or oxidized, to return to the earth and give elongation to the roots, rootlets, and fibres; so the inhaled air of animals in a similar way purifies the blood in the lungs, by re-oxydizing it, to be again sent round its course to be blackened and carbonized in the veins.

Attentive observations during the felling of oak timber in the spring, when the trees first begin to bud and the bark is easily taken off, will throw some light on the subject; and a hop farmer at Farnham drew the author's attention to it, by saying, that in cutting the hop bines for picking, he observed them to bleed very much. (At Farnham they cut the hop-bines early, when the sap is in full flow). This person proposed to lay his poles over the bines for picking, without cutting off the bine until the hops were picked; thus the sap would be gradually checked, with less injury to the roots. The hops being off the bine no longer attract the flow of sap, hence the bine may then be cut, without the flow of sap being expended.

PRESERVATION OF HOPS.—VARIOUS MODES AND REMARKS THEREON.

To preserve any vegetable of its natural colour, and to retain its odour, is a chemical process, and should be well understood; odoriferous flowers are preserved with their colours retained, in many parts; from America they are sent to England, pressed as close as a board: and so might hops be preserved,—the moisture pressed out without much drying.

The best possible way for retaining weight and colour, is to pass a current of hot air, of the full temperature of summer heat, through a layer of hops, in a darkened chamber or kiln; light will tend to change the natural colour, and greatly heated air will reduce the weight.

Drying hops in the sun will much injure their colour, by the process of bleaching, particularly if they become wetted in the process.

Drying with a current of boiling water, passing through pipes, is a clean method; the air becomes heated in contact with the pipes, and passes up through the hops. This may be done and occupy but little room.

An inclosed kiln and flue is also used for drying, the air being heated by coming in contact with the kiln and flue; this is called a cockle kiln, in which any sort of firing may be used.

The most common method of drying hops is by a kiln, open from the fire to the hops, in which charcoal, coke, or a coal which does not yield any smoke is burnt. These various kilns will be considered under the practical part of this work; our province now is to consider the chemical effects on the hop, by the various methods.

In all the various methods of drying, the assistance of sulphur is generally had recourse to, to give the hops an unnatural colour, to make them of a more pale yellow than they could possibly be in the best of seasons. The effects of this article are very evident

in the sample, both in colour and scent. In most parts of Kent and Sussex the growers use the sulphur without any sort of scruple, and indeed boast of how much they have used, without considering the deterioration which takes place in the process, and how much they are acting against the law.

At Farnham the sulphur is used with great caution; some growers do not use any, and where a little is used it is done without any boast, and indeed secretly put into the fire, and that man is pointed at who unblushingly uses it in profusion. Hops at Farnham have been returned to the grower by the purchaser, in consequence of his finding out that sulphur had been used in the drying process, which made them of an unnatural colour. It is this cautious manner of drying, this sparing use of sulphur at Farnham, which is the second cause of the superior price they always obtain, for the purpose of brewing pale ales in the West of England. Green is here the desirable colour, whereas in Kent and Sussex yellow is the object of the growers. While colour, and not pungency, is the principal object of the factors in the borough of Southwark, so long will sulphur be used in the process of drying. A question is asked by the growers, how does sulphur injure our hops, or does it not rather improve them in quality? In the first place, they do not keep their weight and flavour for so long a period, when so volatile an article as sulphur has been incorporated with them; hence those which are dried without sulphur are always first sold, and it is seldom that Farnham hops remain unsold more than a year, however much the price may be above the Kent and Sussex growths, (the growers at that place using but little of this deleterious article,) whereas those of Kent and Sussex are often kept for years, until they have not been worth the expense of the duty of 18s. 8d., and have been known to be taken out to sea for the purpose of getting back the duty, and thrown overboard to save the bags.

Sulphur when volatilized, combines with the oxygen

of the air, and forms oxide of sulphur; for this formation, therefore, it should be consumed slowly, for if it is burnt in the fire it forms sulphurous acid. Silks that are a dark lilac, may, by the fumes of sulphur, be converted into a beautiful flesh colour. Vegetable blues are bleached white; a rose or a dahlia held over the fumes will immediately lose some of its dark colours. This sublimation of sulphur is a raising by heat what is again condensed by cold into a solid form; flowers of sulphur are made in this way, and could a powerful magnifying glass be brought to act on those hops, which have been much fumigated with sulphur, they would be found to be covered with *crystals of sulphur*, in the same way that soot is formed by our fires in the sublimation of sea-coal, and adheres to the sides of a chimney.

The burning of charcoal in the drying of hops is likely to give a greenish hue to them, from the quantity of carbonic acid gas, which is made to pass through the hops. The coke which is used contains a little sulphur, but no hydrogen, the latter being driven from the coal in the baking. The Welch coal used for drying, does not give out any smoke; the constituent parts of it are carbon, sand, sulphur and iron, with but little bitumen or pitch; it is the hydrogen in bitumen which gives inflammability to coal. The coal which contains the iron pyrites, without bitumen, is the best article for drying where sulphur is required; for here is the sulphuret in a better state than crude sulphur, it being in combination with iron.

Drying of flowers for medicinal purposes, is termed **EXSICCATION**, and is managed in a way to preserve all the qualities and the colour. The virtues and colours of flowers are preserved in the greatest perfection when they are dried hastily by the heat of a fire, as great as the sun can impart in a summer's day; all juicy plants are thus preserved, or they turn of a dark colour.

Odoriferous herbs are thus dried until they become

friable, and have but little scent, yet as soon as they are infused in water, the virtues are extracted and shew themselves in full force, in the same way as we experience in making a decoction from tea.

The strength and virtues of flowers are best indicated in proportion as they retain their native colour, and this is done by a quick process, and by drying a small quantity at a time; those plants which are replete with a subtile volatile matter, are pounded and preserved in close vessels immediately after the exciccation.

That hops are replete with a volatile matter, is evidenced by the preference which is always given to new hops by the brewers,—they always obtain a higher price at market,—and hence the necessity of adopting the best methods of pressing and preserving, particularly in an abundant year. Some dealers in hops, and brewers in the West of England, who purchase their yearly stock at Weyhill in October, put them into a screw-press soon after they get them home and press them into little more than half the bulk when purchased.

Tea, which forms so considerable an article of commerce from China, will serve as a guide how much may be done by chemical management in drying vegetable leaves, so as to retain their colour and quality; for it wholly depends on the management, whether the tea shall be green or black. The leaves which are dried at a low heat are found to retain more of the original colour, and peculiar qualities, than those which are submitted to a high temperature; hence the green colour retained by the Farnham hops may be considered one other great recommendation to them, and tend to occasion the additional price they obtain in all markets, in the same way that green tea is always the highest prized. The finest and strongest teas scarcely colour the water in which the decoction is made; and, for the same reason, the fine Farnham hops are purchased for making the pale ales in the West of England.

The strongest tea made in China, is called *Yutien*, and consists of the scarcely expanded buds of the plants, and is used on occasions of ceremony, scarcely colouring the water.

Saltpetre, (nitrate of potash,) is sometimes used in the drying process, it being one of the bases of vegetables in union with nitric acid, and would imply that no injury could arise from burning it under the drying hops, and that it would give a verdency to the article; and so it probably may, but being of a very volatile nature, it injures the keeping quality of hops, and makes them change, like a barometer, with every change of weather.

(Further observations on this head will be found under the article Kiln, and the practice of drying and keeping.)

What has been hitherto said on this subject of hop culture may be considered as the theoretical division; we have now to consider the practice of the growers, and to offer some hints thereon to conclude the inquiry.

CHAP. VII.

THE PRACTICE OF HOP CULTURE.—THE QUALITY, EXPENSE, PREPARATION FOR THE MARKET, AND COST OF CULTURE; WITH OBSERVATIONS ON THE CONSTRUCTION OF KILNS FOR DRYING.

PRELIMINARY.

The details of practice, which will now be attempted, are not intended to instruct the old practitioner, but are for the tyro in hop culture. The old practitioners will generally spurn from them any thing

taught in a book; and will doubt that any improvement can be made on the practice of their forefathers; yet it is hoped, if they will peruse these pages, they may find some hints worthy of adoption.

The propositions that have been made, and the positions advanced, in the theoretical inquiry, although not in accordance with general practice have been quite well established by the author's own operations for several years, and have led to conviction in the minds of many deep-thinking practical men, as evinced by the numerous congratulatory remarks offered by hop-growers in various parts of England, who have read his *Essay*, "*The Golden Farmer*."

TILLAGE OF THE GROUND.

Culture of the soil is the first point to be considered in forming a hop-garden, and the first expense, when properly done, is always the cheapest. As the crop, or plant, is to remain in the same ground for many years some pains should be taken with it. The roots will penetrate deep, they therefore should have opportunities given them to do so. Ploughing deep is not sufficient, although some persons may prefer it in particular soils; however loose the bottom soil may be, it will still be improved by being removed; it is, therefore, recommended that the ground be well broken with the spade or fork, two feet deep; let the top soil be mixed up with the bottom, and also put in the manure to a good depth, the deeper the better, for the top soil may at any time be repaired by manures, but the bottom cannot. These remarks will be found to agree with the nature of the roots, particularly if the plants are raised from seed. By no means burn the surface, for any sod, weed, or rubbish may be put at the bottom of the trench, and will act as a sponge in holding moisture for the growth in a dry season.

There are objections made to the trenching of ground, particularly to the burial of the best soil at the bottom; and the objections are just, where the soil is of a stiff clayey character. The object in

trenching is to amalgamate the soils, it is therefore highly improper to put into the bottom of a trench, a clod of earth unbroken, for the roots of hop will not ramify, unless the particles of earth cohere in a proper manner; there must not be any cave-like spaces left amongst the removals, or it will be years before the soil becomes sufficiently connected for the roots to flourish. Some practical men will contend that the hop does not flourish until the roots get well into the solid unmoved earth; in some situations and soils this may be correct, and would shew that the roots are searching for something which they cannot get on the surface; this is not dung, but in reality a moisture which they cannot obtain in the thin soil of the surface; amalgamation is the point which will be the means of keeping up a chemical action and an adjustment of the electric states.

Although a stiff soil has been recommended for hops, yet it will be found that few soils are better than a black garden mould, provided that there are at least two feet of soil, and that the superfluous moisture gets readily out of the way.

Ploughing the top, and digging or forking the bottom of the furrow, is often practised in preparing ground for hops. A trenching or draining plough might be used for this purpose.

Trench ploughing may be done very effectually by the plough invented by Mr. Robert Green, which he has called "Patent under-draining Plough," sold by Messrs. Plenty and Co., in Smithfield; he recommends it to follow the common plough in each furrow; thus, an acre can be trenched in a day, 16 inches deep, and mix the soil nearly as well as if done with the spade. Another plough has been constructed for the like purpose by Mr. Pearson in Kent, and strongly recommended by T. L. Hodges, Esq., M. P., as a draining plough for clay lands,—a model may be seen at the Society of Arts, London. But the instrument invented by Mr. Smith, of Deenster, near Stirling, is the most effectual, as a sub-soil plough; it is said to be the

means of rendering that which was sterile and unproductive into fertile and productive land; indeed, it is an error on the part of the farmer, particularly a cultivator of the hop, to be working a thin shallow super-soil, with a stiff retentive sub-soil; for whatever may be the tillage of the surface, however expensive the dressing may be in the cultivation, and whatever pains he may take, still the nature of the subsoil will always counteract its beneficial effect, unless the under soil is broken to a good depth: hence the service of deep culture.

The tillage must in some measure conform itself to the mode of planting, which we have next to consider, the distances being 5 ft. 6 inch. apart, and the hills placed opposite the middle of the adjoining spaces, a quincunx form, thus—



then the horse-hoe may be used three ways; this method would supersede the necessity of breaking and hoeing.

Columella, a Roman writer, affirms that those vineyards pulverized the most, produce the most grapes, and, if the pulverizing system is neglected, the ground will produce nothing, the vines become starved.

Virgil directs the same in all vineyards, without exception, thus—

——— “ *Glebaque versis*
Æternum frangenda bidentibus.”—2nd *Georgic*
398th line.

This translated verbatim would be—“The lumps of earth to be continually broken with two pronged bent forks.” This principle of tillage was taken up by Jethro Tull, about 130 years ago, and practised by him with success on his farm at Shalborne, Berks.

The land he describes as a thin soil on a chalk,—
“In dry weather the whole staple looks of a white

colour." This was a calcareous soil which never dries up, and, if kept clean by tillage; very little dung would be required to make it fertile, and hence his success in the horse-hoe husbandry; but he fell into a mistake in concluding that all soils had equal capabilities of yielding corn by tillage only. He was no geologist, and was like the metaphysicians of old, who wrote of the capabilities of other men's minds by the index of their own.

PLANTING.

The ground having been harrowed down to an even surface, may be set out for planting, which will be assisted by having a long line with a feather looped in the line at the distances that are intended for the plants, or a chain may be used in a similar way; the distances should be regulated by the structure of the soil, and the mode of culture intended to be adopted. If the horse hoe is intended to be used for tilling the alleys, which is the best mode of culture, then the distances should be from five feet six, to six feet six from the centre of one hill to the centre of the other; if the spade culture is to be the only one adopted, then the distances may be less than five feet six; this should be regulated by the rich or poor mixture of the soil, a sandy loam being the best for spade culture.

The distance of five feet six is convenient for calculating the number of hills in an acre, it being one-third length of a rod, therefore nine squares of five feet six will occupy a square rod of ground, and 1,440 squares will constitute an acre.

(See the table of squares on an acre, at the end of the work.)

Sticks having been placed where the holes are to be dug for the plants, the holes should be made deep and wide according to the nature of the roots; if cuttings are used as sets, without bedding them for twelve months, then a small hole will be sufficient, and it is usual to put in three of these close together; if the sets have been bedded for twelve months, and

have good roots, then two plants will be sufficient, placed diagonally in the hole; but if the plants have been raised from seed, and have good roots and tubers, then one will be sufficient for a hole, if more is put into the hole they will grow into one mass, and impede the correct ramification of the roots. In planting, attention should be given to placing the male plants one in every hundred at the least; that is every tenth hill should have a male plant; some of them should also be placed on the south east and south west sides of the field, as the wind generally blows from those quarters in the blooming season.

The planting should be done early in the spring, about the end of March, and if the ground is made ready the previous autumn, it will be better for the winter's fallow.

In some soils it would be advisable to increase the distances, to eight or nine feet, and set four poles to each hill at two feet from the hill, and train three vines to each pole, this will give room for sun and air and also for culture and growth of the roots.

MANURING.

Some remarks have been made on this subject, under the head preparation of the ground, viz. to dung the ground, over the whole, and to bury it as deep as possible; if a mineral dressing is adopted—a marl, it need not be buried deeply, but left to mellow the surface for tillage. To put rotten dung into the hole when the plants are set is of but little use, as the roots soon grow beyond the hole; and as the large and principal roots do not have so many of the fine fibres, consequently not so many mouths, as the more distant roots have, for the same reason it is of little use, to put dung on the crown of the plant, at the time of earthing up; indeed it is like putting food on a person's head and telling him to eat it, or like dunging the poles, to put it at about a foot distance round the hill is more reasonable, but never so well as at the first digging in the early spring; therefore the dung

should be carted on during the frosts of winter; at this period the prepared London manure should be used, as mentioned under the head Manures. Where winter tillage is adopted, long dung might be put in when the furrow is turned back. (*See Culture*).

CUTTING SHOOTS.

At the first digging in the spring, which is generally performed in March, the earth is thrown away from the hills to enable the cutter to come with his pruning knife, to cut away the old bine within an inch or two of the crown, leaving two or more shoots, or in strong grounds the old stump is cut close to the root. That portion which is cut away has several buds upon it, and is the portion usually taken to form sets for new plants. It is not usual to cut any portion away from the young plants of a new ground, for the first two years, as it is thought to weaken them, previous to the roots establishing themselves in the ground; the cutting is generally finished by the middle of April.

POLING.

The first years poling is generally a temporary affair, those of six feet length are sufficient, but if the plants are from seed, and two years old, and in good ground, they will require twelve feet poles; as Mr. Avenell's did, at Farnham, mentioned under the head, "Sets from Seed." In Kent and Sussex it is usual to put three poles to a hill, but at Farnham two is the usual number. The operation of pointing the poles, and making the holes for them with a heavy iron bar, are such simple mechanical operations that they need no description, further than to remark, that the poles are set so, as to be at a much greater distance from one another at the top, than at the bottom, and crooked poles are set to turn outwards, so that the hops should not grow entangled, and house over at the top, and thus prevent the sun and air getting to the lower parts. About 500 poles, or one-sixth of the gross quantity per acre is usually required to keep up the number

used, this allows for breakage and rotting, so that in six years a complete fresh quantity will have been required. Poling is generally executed at the end of April or beginning of May. Poles should rather be too short than too long for the strength of the hill.

In those situations where poles are scarce, or where the garden is on a hill, and much exposed to injury from high winds, a method may be adopted of training hops obliquely, on poles four or five feet high, with a pole fixed horizontally on the top of them; single plants may be placed at every pole, which may be three feet apart, and between the rows six feet six at least should be allowed; the rows should be placed N. W. and S. E., that the ten o'clock sun may shine upon them; the training should be towards the east, and will require attention in the tying. The picking may be done without taking down the poles, they, therefore, should be charred, or so prepared as to make them lasting at the surface of the ground. At every fifty feet there should be a male plant, which might be allowed to run up a pole in the usual way and placed a little out of the line of the others, that it may be known. The male plants thus running up above the others, will have uninterrupted facilities of shedding their farina over the females between and beneath them.

Hops yield best when trained near the ground; a blown down and leaning pole often has the best produce of hops. Poles might be set into the ground leaning towards the East, and at every ten or twelve feet a pole put upright to steady them, to which they may be tied. The training for a small garden might be done in this way as an experiment, and this training would be the means of checking the great flow of sap in the elongation of the leading bine, and make them throw out with more energy the lateral shoots; the plant will be kept warmer, than when more elevated, and yet be trained as far from the root, as if running upright, and not be more than six feet high; in this way the hops may be picked without cutting

off the bine, and prevents their bleeding, when cut off in the full flow of sap. A hop garden trained in this espalier way is within the reach of any small farmer; here labour will supersede the necessity of long and expensive poles, indeed in some places they are not to be had; yet six feet or eight feet poles may be procured almost any where. When poling has been done in the manner above described, it will be easy to top off the leading bines, when they begin to throw out their lateral shoots, as is often done with good effect, the vigour of the plant being thrown into the hop instead of bine. The wide spaces proposed in the article of "Planting," is the most likely to insure a crop of hops every year; and by judicious pruning, the inordinate growth of vine upwards is prevented, to the benefit of the side shoots on which the crop depends.

TYING.

This is performed by women soon after the poling, who select the outer shoots of the crown, and train up two or three bines to each pole, using dried rushes for the purpose, and is attended to by them two or three times in the course of the early growth; in an uneongenial season, the bine will leave the pole, and it is then necessary to have a ladder for the purpose of tying them; after the hops have topped the pole, the hint of, White, in his Selbourne, may be adopted, by cutting off the tops, with a knife fixed to a stick, to make the lateral shoots throw out stronger.

TRIMMING AND EARTHING.

This consists in cutting away the superfluous bine, not tied to the poles, and is performed about Midsummer, when the bine is quite finished tying. These cuttings are a most excellent fodder for cattle, when they are harvested and stacked up for the winter. After the trimming, the earth is moved around the hill and heaped up in the form of a cone, covering up the crown of the plant, which checks any further shoots

from it, but is of no service in giving vigour to the plant, further than the removal of the earth around.

At this season of the culture it should be remarked if the bine is growing too luxuriantly upwards, and not throwing out sufficient off shoots, for if so a pruning of the top should be had recourse to, thus following the practice of gardening to create fruit by pruning away useless bine.

CULTURE AND CLEANING THE GROUNDS.

In every instance where much moving of the surface takes place, the hops are always the better for it. The first business in the spring is to turn back the furrow slice from the hill, which was thrown up the previous autumn, for it is always best to open the alleys between the hops, by two plough seams, one turned one way and the other to the opposite side ; this then turned back into its place, makes the operation of digging a much easier task, but if harrowed down and the hills opened it would be still better. This winter tillage is not a usual practice, but whenever it has been adopted, it is found to have a good effect, and may be considered as a winter fallowing, mellowing the ground and making it work freely in the spring ; it also prevents the winter growing weeds getting a head, and gives an air of attention, and husbandman-like surface to the garden. If this is not done the surface becomes caked over, and if it is stiff land, the surface is very hard to move with the fork, which is the next operation, previous to which it is usual to cart on the dung, or mineral dressing, whichever the ground may require, or circumstances supply, at this period ; the animalized carbon and refuse from breweries should be put on the ground, and worked in. Where the practice of opening a furrow has been adopted, the dung might be put into the trench, and covered over with the return slice, particularly if the dung is of a long kind.

In forking the ground attention is had to the opening of the hills preparatory to the cutting. The

next removal is generally done with a beek hoe, having three prongs, and this operation is performed two or three times in the course of the summer, or it is beeked twice and flat hoed once, so as to make the surface, by the time the hops are ready to be picked, in a fine permeable state, the rains and night dews being admitted to the rootlets and fibres.

If the horse hoe is used, it may be put into the ground soon after the first digging, and continue to be used until the hop is ready to be picked; it is an essential matter of attention, that the surface be kept open during the growth of the plants, and whilst they are coming into hop, being the period when they are requiring nourishment—when they are drinking much; therefore, the night dews should be admitted to the roots. It is not necessary that the horse hoe should have duck feet, for the continued moving of the surface, but plain tines as a harrow, so that the points penetrate at least six inches into the ground, which will be found much easier for the horse. Should there be ground not moved where the hoe has crossed the contrary way, the beek hoe must be had recourse to, that the tillage may be complete round the hills.

This culture with the horse hoe must be very old, although it was brought into notice about 100 years ago by Tull, still it was the common practice amongst the Romans to cultivate their crops by using a triangular hoe, having two guide handles, and it is particularly mentioned by Virgil in describing the culture of a vineyard; indeed his description of vine culture corresponds very much with the present practice of culture in a hop garden.

The cultivator of the hop should also bear in mind, that nature may be forced, directed, and assisted in this crop, as she may with a crop of grapes, apples, or nuts, which, but for judicious pruning and culture, would run wild, and produce fruit only occasionally. As trees are planted singly so should hops, and have the sun and air admitted freely amongst them; the

roots should have room to range and not rob one another.

If the growth is tardy, cut away all superfluous bines, that vigour may be given where it is wanting; the lower lateral shoots taken off will send vigour to the top; on the contrary if there is too great a produce of bine let the spare bines remain until the trained ones are preparing to blow, that the superfluous parts of the plant may be made a regulator to the productive parts; and not be guided by customary time, without regard to the wants of the plant.

The cultivator should also consider that this crop may receive assistance from a winter culture, in the same way that land gets a sweetening, for a corn crop by fallow; experience teaches that as the frosts and snows of winter mellow the land, so they also give that essential quality to the soil, which it gets by an æration, viz., carbonic acid gas, and oxygen of the air, which really are constituent parts of sugar, and therefore sweetens the land.

There are some tenacious lands, which are rather injured than benefitted by the treading of horses in hoeing; in such land manual labour must only be depended upon.

If attention has been paid to the above directions, and healthy seedling plants made use of, then it is reasonable to expect that there will be a crop.

PICKING OR GATHERING.

The first care towards picking, is to be provided with plenty of hands, and with baskets that will hold seven or ten bushels marked inside with the measurements at the different depths; or bins made with cleft poles, and a bag hung inside. These articles, and the fire in the kiln ready, the pole pullers may begin, by cutting the bine at three feet high, and pulling up the poles with a lever, having an angular notched staple, at one foot from the end. The picking should commence where the crop is ripest, which will always be around a male plant; these

will be found to have hard and pungent seed, of a brown purple when ripe. When there is much ground to go over, it is necessary that the picking should be early, or those hops which get to be over ripe, are liable to be blown away, nature having designed the hop petal to act as a wing to spread the seed abroad; moreover, when the hops are ripe they are liable to great injury by bruising, which changes them to a brown colour. When quite ripe the seed is of a dark colour, and the last petal extends beyond the others, called "the tongue," they also become of a bright brownish green colour.

In some districts a long moveable shed is constructed, to be put up in the garden, covered with cloth during the picking, and with hop bines during the winter: this shed serves a double purpose, viz., for the shelter of the pickers, and a cover for the poles during winter; it is also of service to lay poles in over night, with the hops on them, ready for picking early in the morning, that the pickers may go to work before the dew is off the tops of the poles, the dryer having often to complain that he cannot get the hops early enough in the morning to begin his work, or that they come in very wet. The pulling poles over the bins without cutting off the bine has been already adverted to as good in the first picking, when the bine is liable to bleed, for the hops being all picked off, the sap is not then likely to flow so much.

The proper time to gather hops is a nice point, for if the picking is very early, a great loss is sustained in the weight; and again, if the picking is late, they are liable to become a bad colour, and to shed their seed.

As the colour assists so much to recommend hops for sale, it must be particularly attended to; in consequence of this, the picking at Farnham usually commences the first week in September, and lasts fourteen or twenty days.

Of so much consequence is the time of picking that it makes a difference in weight of nearly one pound

in every five, between early and late picking, particularly where there is a good proportion of seed; the hops for the brewing of brown stout or porter should be left hanging until they are ripe and brown, those for pale ales, and delicate-flavoured beer, should be picked early.

From the above observations will be seen the propriety of being well supplied with hands, that the hops may be gathered as fast as they ripen, particularly if there is much wind. Wet nights and hot sunny days will discolour hops.

It is an animating scene to see a whole family round a bin actively engaged, and is indeed a second harvest for the agricultural labourers' family, and one which they go to with great hilarity. The prices for picking vary according to the plentifulness or scarcity of the growths; from one penny to two-pence is the price per bushel, three halfpence being the most common price, and at this a family of five will earn in fine weather, seven or ten shillings per day. The bins in most parts of Kent are provided with a crop piece at each end for a pole to lay on, and against this the poles with the hops on them are placed; where baskets are used they are laid on the baskets, or on trestles prepared for the purpose.

The accounts are often kept in a primitive manner, by wooden tallies, which are about sixteen inches long, two inches wide, one-quarter inch thick, but one-half thick at the end, where it is fitted by various bevelled cuttings to the piece kept by the pickers. These two pieces, numbered and fitted in such a way that no other one will correspond, being put together, a notch is filed across the edge of both for every bushel, and when twenty is counted on one edge, it is cut off, and a single notch is cut on the other edge, to denote twenty.

This primitive method of keeping accounts was in use when writing and arithmetic were not so well understood as at present, and is similar to the exche-

quer tallies, which occasioned the burning of the Houses of Parliament in the year 1834.

Some years the produce is so trifling, that it is given to the workmen to clear the ground.

The quantity per acre may be calculated as the picking proceeds, by knowing how many hills there are to the acre, (*for which see the table of squares in an acre*). If the distances are 5 feet 6 by 5 feet 6, which have been recommended in this work, and there should be one bushel to each hill, there being 1,440 hills, the weight taken at $1\frac{1}{2}$ lb. to each bushel, (they will be heavier than this; if male plants are cultivated, and the hops are left to be ripe,) then the weight will be 19 cwt. and 32 lb. per acre. If the distances are 6 feet each way there will be 1,210 hills to the acre, 1 bushel to each hill, at $1\frac{1}{2}$ lb., will give 16 cwt. 23 lb. per acre. The picking being only one peck to each hill, of course there will be only one-fourth the above quantities.

The hop bine when cleared off the poles might be made serviceable to most farmers, for tied up in bundles it will make an excellent bottom for stacks, or shelter for cattle, and after being in use for twelve months would be partly rotted, and might then be put into the dung yard for complete decomposition; if put into the dung yard without previous rotting, it would be much too fresh, and be in strong strings when the yard is yearly cleared out, but if previously used for some months the bundles would fall into small particles, and if placed under a hay stack, it would be likely to get some additional carbon or potash.

Cloth for the pickers bins, and for carrying the hops from the field to the kiln, is made at Farnham, 40 inches wide, $1\frac{1}{4}$ lb. to the yard long, the price being 9d. per yard. Mr. John Ledbitter is the manufacturer, who makes cloth many yards wide.

At Farnham the picking is more carefully done than in most other places, no leaves being allowed to go

into the bin, and each bin has a basket for the selected damaged hops, and all that are of brown colour ; hence another cause for the superior price of these hops.

DRYING HOPS.

Under this division but few remarks need here be made, as the subject has been spoken of under the head "Chemistry and Colour," and will also be again adverted to under the article "Kiln," but it may be repeated that a quick process is desirable for dispatch and economy, and that the kiln described under its proper head embraces these objects. Some old kilns may be contrived to have a second floor above the principal one ; or trays with canvass bottoms over a portion of the surface, towards where is the greatest draft ; this would forward the drying process, particularly when the hops go to the kiln in a wet state ; thus forwarded, they may be dropped to the floor below them : it is highly essential that the water should be evaporated before the principal drying takes place. In those kilns constructed for the purpose of drying malt, and used occasionally for drying hops, a contrivance might be adopted for contracting the large opening, and for keeping back the heated air, (*See Cowl.*) a tin reflector, or several small ones, might be suspended to act as reverberators over the hops ; this would save the trouble of turning them on the floor, for if the stalks and leaves or petals can be made brittle, and to separate, they will be better without the turning. This turning may be done by throwing the hops all in a heap in the middle of the floor and then spreading them out again, or it is done by men walking through the layer of hops and moving them with the feet.

For the dispatch of drying, a thickness of from one to two feet of hops are placed on the kiln floor, and a fire of culm, or Welch coal, coke, charcoal, or other material that gives out no smoke, is made in an open fire-place, with only a perforated hood

over it; the heated air passes from this fire through the hops above; or if the kiln fire-place is enclosed, and the smoke flue is made to pass round the building, any firing may be used; the air coming in contact with the hot flues, passes in a pure state through the hops above. But the neatest and cleanest method is by passing hot water through pipes, close beneath the drying floor. (*See the description under the head Kiln.*)

If the hops have not been sufficiently dried, which the dryer ought to know by the appearance of the surface, and should they be bagged in this state, they will become mouldy, particularly towards the outside of the bag, if placed in a damp situation, or a moist air gets to them.

The object of subjecting hops to such a great heat is to drive off the aqueous particles; of course there will be more to do if they are picked whilst wet; but when they are not so it takes from seven to ten hours to get them sufficiently dry.

When the hops go to the kiln in a very wet state, it would be well to have hurdles put on the floor-cloth, to keep them up light, and to admit the heat freely through them, or they may become coddled and stick together from the quantity of moisture.

The quantity on a floor will be various according to the size of the kiln, but from 100 to 200 bushels may be calculated as the general quantity; a bushel is equal to a square base of 12 inches and $15\frac{1}{2}$ inches high, therefore a floor 12 feet square covered with hops to the depth of $15\frac{1}{2}$ inches will contain 144 bushels; the layer is found to sink in bulk as they become dry.

In the first stage of the drying it is proper to have but a small fire and a great current of air, that the first steam may pass gradually away, the heat should then be increased.

When the drying is done with coal or coke, it is best to use some charcoal with it, about 30 bushels, and a chaldron of coke or coal is generally allowed for a ton of hops.

If a little sulphur is used at the first setting on the fire it gives vigour to it, and raises up the layer; moreover, the sulphur will adhere to the hops best when they are in a moist state. When a great deal of sulphur has been used, such as a cwt. to a ton of hops, as is often done in Kent, although a considerable quantity will adhere to the hops, yet much will escape from the cowl, so much as has been known to kill plants growing in an adjoining garden. In using the large quantity above stated, it is put into the fire throughout the drying, or a portion is put into a pan in a hot part of the kiln. When the crispness has arisen to the top of the layer, which will occur in eight or nine hours, it is usual to turn, or move them, and give them another good fire to finish them off; one of the best criterions of their being dry enough, is, when taken off the kiln, that they are brittle as glass, and break between the hands when rubbed.

When hops are in a very bad state, having been infected with mould, and become very brown, it may then be advisable to use sulphur, and there may be an excuse for using so much as 1 cwt. to a ton of hops; and there may also be a cause for using saltpetre in the bleaching to improve their colour; but in East Kent it is a very common practice to use 11b. of saltpetre to 14lb. of sulphur, even when the hops are not in a diseased state; and this is to give them a delicate colour, but it injures their weight and fragrance.

To regulate the drying, it is proper that a thermometer be hung up to the wall of the drying floor, and the heat by that instrument, and the assistance of a damper to the cowl, might be kept up to a regular degree, agreeable to the state of the hops on the floor.

There will therefore be a variation in the drying heat, and experience only can teach the proper degree; from 98 deg., being blood heat, to 112 deg., fever heat, is the usual heat required on the floor. One

part of a floor will generally dry faster than another, which may be regulated by the current of air to the fire, or by putting an extra thickness of hair cloth over the floor when the heat draws too much.

In the open kilns where charcoal, coke, or culm is used, it is necessary that all the air which passes up through the hops should first have passed over the fire, to become heated and rarified thereby: the consequence is, the air becomes much lighter, and passes upwards through the hops to the cowl or vent; there is therefore a continued stream of air passing from the ground through the fire and to the cowl above; this is the principle of all drying processes.

Hops that are dried over a fire are better than those dried in the sun, as has been proved in the drying of other flowers; they will also sweat or ferment upon change of weathor if dried in the sun. Fire exhales the watery parts, and, by retaining the oily, preserves their strength, flavour, and colour.

The expence of drying hops may be stated in a rough way at 14s. per cwt. including the hire of kiln, firing and labour. If charcoal is used it may be calculated, that from 60 to 100 two bushel sacks of coal, will dry one ton of hops, five sacks being generally allowed for one cwt.; but this will depend in some measure on the quality of the charcoal— $1\frac{1}{2}$ cord of wood will make eighty bushels.

Sir H. Davy in his *Agricultural Chemistry*, gives the quality of different woods for the produce of charcoal, the best article being chestnut, 23; and oak, 22; beech, 19; elm, 19; pine fir, 19; ash, 17; birch, 17; Scotch fir, 16, parts of carbon out of a hundred. The best charcoal is made by dry distillation in iron cylinders, by that means extracting the pyroligneous acid.

Charcoal, should be made twelve months before it is used, it will then have imbibed a sufficient humidity to make it more lasting than if used as soon as made; if it is not put under a shed the coal should have a

thatched cover put over it. The inferior woods, such as fir, made into charcoal, require damping the day before used; the gases composing water become a fuel, in union with carbon, the heat given out being the combustion of carburetted hydrogen. The experiments made on wood coal go to show that most of the coal in common use is a triple compound, consisting of carbon, hydrogen and oxygen; to obtain the carbon only, the coal must be made and kept in a close vessel, to prevent the air getting to it; most of the coal properly made will make a strong and clear fire. Charcoal is not soluble in any of the acids, but may be dissolved by plunging it in a solution of the liver of sulphur, to which it imparts a green colour. Fresh charcoal made of wood, strongly attracts the air, and will absorb it for a considerable time; the goodness and lasting quality in the fire, arises, from its capability of consuming, or decomposing the air.

Hops after being dried are best to be laid in a heap to sweat and grow tough, and if they were covered with a cloth, they would bag the better; there is no limited time for their becoming fit for the bag, for it will all depend on the state of the atmosphere; three or four days are generally sufficient, but when the hops feel moist and clammy and can be squeezed in the hand or trodden close without breaking, they are then fit for bagging.

Some persons have their hops bagged as soon as they are cold, particularly those growers who have not room for them to lay a few days; when this is practised, or, if they are packed in a hot state, they come out of the bag very dusty, and will have increased very much in weight after they were *excised*; thus the grower loses by the hurried manner of bagging if he sells early, and by the excise weight, but this is seldom the case; they are generally weighed to the buyer.

The closer they are packed the longer they will keep, for if the air comes in contact with the oily

matter, it will take off a portion along with the odour, together with any volatile sulphur with which it is in connection. A quick process is found to be the best, to preserve the colour, and the virtues; the Chinese method of drying tea, which is a quick one, shows how the virtue in leaves may be preserved, they put the leaves on a hot plate, and roll them by hand, and afterwards fan them to cool quickly.

BAGGING.

This is performed by having a round hole cut in the floor of the store room, a square box is fixed over it with a corresponding hole raised nine inches, to which the bag or pocket is hung, fixed with a hoop, which passes over the edge of the bag's mouth; into this the hops are put a little at a time; a man gets into the bag and treads them, being at first as deep as he is high, attending particularly to the outside, to prevent the air getting to them.

A half hundred weight is often put into the middle to assist in the pressing, having a cord, with which the man pulls it up; a lad will keep the bag supplied as fast as two men can tread it in, two poles are therefore provided. At Farnham, to complete a bag which will hold more than 2 cwt., from three to four hours is occupied; to tread four in a day is considered excellent work for one man at 9d. per cwt.; but in Kent the pockets of $1\frac{1}{2}$ cwt. are trodden in half an hour; of course the work is not done so well, for the closer the hops are pressed the better they will keep. This process of treading is a tedious and unpleasant work for the men where it is done in a proper manner, and occasions great thirst by the quantity of dust which arises, the treader being as yellow all over as a sovereign, and the yellow dust is very choking; the state of their stockings will show the goodness of the hop, and a good sample may be taken from the heel of their shoes.

The propriety of allowing the hops to remain for some days after the drying, has been noticed under

the head of chemistry; it is advised to cover them over with blankets whilst they are sweating, or imbibing moisture, if they are bagged immediately on coming from the kiln, they would break into dust, moist weather therefore is the best time for bagging. A bag to contain $2\frac{1}{2}$ cwt. of hops, will require $5\frac{1}{2}$ yards of cloth, the weight of which is $5\frac{1}{2}$ lb., the price is 6d. per yard or per lb., as sold by Mr. Led-bitter, manufacturer at Farnham. The common rough bag used in Kent and Sussex for the inferior sort of hop, is made at the workhouses of the various parishes, as at Maidstone, and at Gainsborough, Lincolnshire. These are made from refuse hemp and hay intermixed with fine tow, the threads being very thick; they are 4 feet wide, 7 feet 6 inches long, the weight allowed being 20lb., into which about $2\frac{1}{2}$ cwt. are packed; the worst coloured hops are packed in them.

With respect to what should be put into bags, and what into pockets, it is best to consult the factor, as to which is in the greatest demand; although the bags are generally the lowest in price, still there are some advantages attending them, there is less expence in packing, the article is cheaper, and the bag which is heavy, is weighed in with the hops.

The Kent pockets are made 3 feet wide, 7 feet 6 long, the weight of which is 4lbs., and contain about $1\frac{1}{4}$ cwt. of hops; the best colored and finest flavored hops are put into these pockets, without much regard to their strength. Coarse bags are said to preserve hops better than pockets, when kept over a year, the outside being thicker, and a larger quantity being put together, there is less outside.

It is the outside of packages which first give way, and lose the essential qualities of the hop, hence small packages should be avoided, or if they are used, and kept for a time, they might be sized over with a strong mixture of gelatinous matter.

In the preparation of bags for the presser, the two

lower corners, are tied into a sort of tassel with a few hops therein, and also in closing up the bag, similar tassels are formed, which serve as handles for removal of the bag.

In each district a person is appointed by the Excise, to mark the bags with a peculiar device, which is varied every year, that they may be known to what year they belong; they are also marked with the grower's name, the parish where grown, and the year.

However close the hops may be packed in a bag by man's weight, they assuredly will be able to be pressed closer at the end of 6 or 12 months, by the natural shrinking of the article; the usual method of closing the bag is by means of pulleys and line, fixed with hooks to the top and bottom of the bag, and a blunt instrument as an axe used to drive in the wrinkles to the inside or middle of the bag, and then to close up the portion of bag gained, by sewing up with strong line, this is done in three or four places round the bag; a more handy method would be, by a strong lever, a 20 foot plank, brought under a fulcrum and over the top of the bag. The necessity of this extra pressing, required at the expiration of one year, sufficiently shows that a superior method of pressing is required for the purpose of keeping hops unimpaired by time.

The allowing hops to remain for some days unbagged, and the superior pressing adopted at Farnham is another cause of the superior price they fetch at market.

PRESSING.

As an improvement to the usual method, the following hints are offered. It is very well known that the closer they are pressed, the longer they will keep without deterioration, therefore, a Bramah's Hydraulic press is recommended to be used, which would close them to the consistency of a soft deal board, and then

may be packed in a bag, made to the size of the press-box, in the same way that bales of cotton are pressed and sent to various parts of the world, and similar to the pressing of hay to be sent on ship-board ; in this way, one cwt. of hops, might be made to occupy no more than two cubic feet of space ; and this would be a desideratum for package, stowage, cartage, and particularly add to its capability of retaining weight and quality.

This method of pressing is not within the reach of every hop grower, for it is an expensive article ; but a lever press may be constructed by any one, and the weight of one or two tons obtained, by a very few half-hundred weights ; indeed any pressure may be obtained by this simple mechanical power, without much expence. Archimedes is said to have asserted, that if he could obtain a fulcrum, he could move the universe by the lever.

The method proposed is this : the rim or cylinder of a tub, open at both ends, made of thin ash wood, hooped with iron exactly to fit the inside of the bag, and about 2 feet high, (or an iron rim would do as well), being put into the bag, is to be filled with hops, and trodden in, to take off the first slack pressure ; on this is to be placed a block to fit the rim, made of two thicknesses of elm, each $1\frac{1}{2}$ inch thick screwed together, across the grain of one another ; several other blocks of wood will be required, in length equal to the diameter of the rim, to be used across the three inch elm one. A lever should be prepared 14 feet long and equal to 6 inches square, a small round butt of a tree would do, straight grained and free from knots. The fulcrum or point of resistance, may be a growing tree, or other strong object, with holes morticed into it, at every 12 inches in height, to take the end of the lever ; the power is to be placed at the opposite end, and the point of pressure, made as near the fulcrum as possible ; weights may then be placed at the extreme end of the lever to any power that

may be required ; the first portion being sufficiently pressed, additional quantities may be put into the rim, which may now be drawn a little upwards, and the bag to follow it, supplying the place of the rim as the accumulation proceeds ; this may be continued until the bag is full.

To assist in the removal of the lever, a post with a cross piece to the tree may be constructed immediately over the line of the lever, with a pulley-block and rope at each end of it, by which the pressure may be relieved at either end ; when the accumulated pressure in the bag is of sufficient height, a scale tray may be hung on the end of the lever to take in the weights, *as per sketch.*

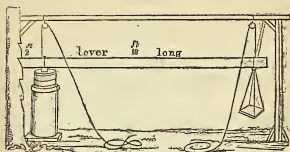
The advantages of this mechanical power over all others, are, that the pressure may be proceeding whilst the workmen are gone to their meals, or whilst they are in their beds.

The power of the pressure may be calculated in this way. The distance from the fulcrum to the centre of the pressure being 2 feet, and from that, to the centre of the weights, being 12 feet ; divide the long arm by the short arm $12 \div 2 = 6$, then every cwt. placed at the end of the long arm, will be equal to a pressure of six cwt. at the fulcrum, and, on the hops, therefore 7 half hundred weights put into the scale will be equal to a pressure of 21 cwt. on the hops.

A 21 feet 3 inch deal plank being used for a lever, and worked edgeways would give the following pressure ; the short arm 2 feet, the long arm to the weights 18 feet, then $18 \div 2 = 9$, then will the pressure be 9 times more than is put into the scales, 7 half hundreds will be equal to a pressure of *one ton* $11\frac{1}{2}$ cwt.

An accumulated power may be obtained, or assistance, whilst the weights are being put into the scale, by putting a strut between the lever and the upper cross piece.

A Lever Press to obtain a power of from one to two Tons.



In addition to the remarks which have been made on the subject of a lever press, it may be suggested that instead of weights being applied at the end of the lever, a set of blocks and line might be used, a strong staple being fixed level with the ground—by this means a pressure of ten tons may be obtained.

A model of this machine, is now exhibiting, at the Gallery of Practical Science, Lowther Arcade, Charing Cross.

It is usual with many hop merchants in London, to press the hops purchased, if ordered so to do. This is performed by a Bramah's Hydrostatic Press, or, by a pair of screwed rods, having strong nuts working against well cramped boards at each end of the pocket. Thus the pockets may be pressed to half their original height, and when so done, strong cords are brought round them, endwise, the end boards being grooved for the purpose. Without this precaution, the hops that are kept beyond the year, get a wind cake or dried crust round the outsides, for an inch or more from the surface according to the goodness of the pressing.

KEEPING.

In the course of this work, there have been remarks made, which will show how they are best preserved

from deterioration, see "*Chemistry*" and "*Scent*;" it remains here, only necessary to remark, that the last proposition of close pressing, is one of the best methods of preservation. It is therefore recommended particularly for all hops likely to be kept over the first year, and in those seasons when there is a plentiful supply, and when it is likely, by the low prices to pay a person for keeping them beyond the year. Although the legislature allows hops to be packed in casks, still the shrinking of the wood makes them no better as preservatives, than are the present bags, which to make them air tight, might have one or two coats of paint or size over them. Damp places must be avoided.

That a great deterioration does take place in the keeping, is evidenced by the much reduced price of old hops, they dropping down to half the price of new, and ultimately are no more value than the amount of the duty paid on them.

Saltpetre, is sometimes used with the sulphur in drying, and bleaching hops, and [when this has been had recourse to, they do not keep so well, as when dried without either.

SALE.

This takes place with most growers soon after they are bagged, and constitutes a serviceable supply soon after harvest, and for the wants of Michaelmas.

The produce of Kent and Sussex is for the most part, sent up to the Borough of Southwark to be sold, being conveyed thither by road waggons, some of which take more than 100 pockets at a time, piled up to a great height, and so managed to suit the rotundity of the road; many are also sent to London by means of the Thames and Medway navigation.

There is a hop fair in the Autumn at Maidstone; and at Canterbury the hop dinners, and Saturday markets in October and November, are the principal periods of sale, the products are conveyed by railway to Whitstable, and from thence by water to

London; the growth, having the City arms on the pockets, sell for about 5s. per cwt. more than the adjoining growths.

The Farnham, Hampshire, and principal places of the Salisbury collection, are mostly sent to Weyhill Fair, near Andover, where there is an acre of ground exclusively appropriated for the Farnham growth, and those not grown in the parish are scrupulously excluded from this acre, which belongs to ten proprietors—it is called “the Blissimere Hall Acre.” At this place they have been sold during the last ten years from 7*l.* to 27*l.* per cwt. viz. the years 1825 and 26. At the fair of 1835, the prices were from 9*l.* to 10*l.* per cwt., the supply being only half what it was the year before, when they sold at 8*l.* to 9*l.* per cwt. The rent charge of the stands, are three pence per pocket; in the year 1836 there were 3,030 pockets brought for sale, of the Farnham growth; and, of the surrounding parishes, and more distant parts there were 5,100 pockets, some of which were from Kent and Sussex.

At this great hop mart there is shed room for all the above quantity; indeed 1,000 more might have been stowed away. From this fair, they are taken principally into Wilts, Somerset, Devon, and Dorset.

The growth of the North Clays and Lincoln, are sold at East Retford.

The Hereford and Worcester are principally sold at the County towns.

The Essex are either sold at Chelmsford, or find their way to London.

The Suffolk find a market at Castle Headingham.

The Stourbridge find a ready sale at Birmingham, and other great towns in that neighbourhood, where every seller makes his own beer.

The Suffolk are sold at Stowmarket, where many of them are grown.

The prices vary in the different districts according to the supply and demand, and the quality of the

article; but the Farnham still maintain the highest price, being generally from 2*l.* to 4*l.* per cwt. higher than most others; particular samples of the Stowmarket, the Canterbury, are, however, often sold for as high a price as the Farnham.

The Sussex are generally quoted at from 1*l.* to 2*l.* under the Kent.

The prices of hops in October 1834 were, for the several markets and best samples, Kent 9*l.* 15*s.*; Sussex, 6*l.*; Essex, 8*l.*; Farnham, 11*l.* 10*s.*; Stowmarket, 10*l.*; East Retford, 9*l.*

To explain the variety of prices, reference must be made to colour, pungency, management, and to supply and demand in the several districts.

To show the fluctuation in the article, and how much supply and demand regulates the price, it may be here stated, that a gentleman at Farnham purchased a pocket of hops in the year 1825 at 30*l.* per cwt., the same hops were resold in 1826 at 5*l.* per cwt., the party sustaining a loss on the single bag of hops to the amount of fifty pounds!!

When there is an overwhelming crop, it is recommended, and it is advisable, that much of the cultivated ground should be taken out of the market, which may be done by keeping the bine cut off for cattle food, and harvesting it, earthing up the hills, letting the roots rest themselves, and occupy the ground by putting one potatoe, whole, as a set, in the centre of the four plants in the quincunx form; and this will pay for the culture better than having the expences of a hop ground, when at a very low ebb, for then the expences may be more than the return, and this will also give vigour to the roots for a crop the succeeding year. (*See table of prices at the end of the work.*)

POLES—THEIR VALUE, QUALITY, AND PRESERVATION.

Every means which can be devised for preserving poles should be adopted, for they constitute a princi-

pal expense in hop culture, and require to be renewed from three to five years, according to the quality of the wood. When the hills are placed 5 ft. 6 inches distance from one another, and there are three poles to each hill, the number required for an acre is 4,320. (*See the table of squares in an acre.*)

The most lasting wood for poles is, unquestionably, the yew; next to this is chesnut, then larch, ash, willow, oak cut in the winter, Scotch fir, birch, alder, and beech; but various other woods are used for poles; the prices of the common woods may be taken on an average of one shilling per foot per hundred; thus, 20 feet poles are worth 20s. per hundred in the wood. Fourteen feet poles may be considered as the average length of poles in Kent, but at Farnham the poles used in the principal grounds may be taken at 16 or 18 feet.

The ready means of getting poles is a great prompter to the establishment of hop grounds, as the renewal occasions a regular yearly demand; the growth of hops and poles, therefore, ought to be near each other.

The most usual method of stacking poles is to place them with their points on the ground, forming a conical figure. At Alton, and some other parts, the poles are laid on the ground, (blocked up with some broken poles) lengthways, in the form of a triangular prism, or the roof of a house; other places they are packed in square lumps, with hop bine placed over them. In any way they must suffer much deterioration during the six months of winter, while they are out of the ground; when laid lengthwise, they give most room for a winter tillage.

As a preventive to decay of some of the commoner woods, and to make them even more lasting than any other, it is proposed they should be saturated with the following patent preparation.

KYAN'S PATENT PREPARATION, AS A PRESERVATIVE
OF POLES.

Fir, willow, alder, beech, sappling oak, and many other woods soon decay at the part between wind and water, that is, level with the ground when in use. The patent preparation, introduced to the public by Mr. Kyan, will prevent this decay; sufficient testimonials have been issued by the Navy Board, as to the efficacy of the process. It is a complete saturation of the woody pores, with a preparation of Mercury (oxymuriate); the expence of saturating the whole pole would be equal to the first cost, a tank being required as long as the poles themselves, but a submersion of the lower parts might be effected after the new poles are pointed, and the bark taken off.

The evidence of the efficiency of the steeping, states, that "The process employed, completely and with certainty, prevents the possibility of the destructive effects of the active principle which nature employs to cause decomposition and decay."—"By the chemical change the fibre of the wood is rendered as indestructible as charred timber."—"It is necessary that the wood remain in the liquid for some days, when every pore becomes filled; and the process is a complete preventive of any insect attacking the part steeped. So completely is decomposition prevented, that the common Canadian timber, or Scotch fir, may be used in situations where heart of oak only could formerly be used."

This process is also recommended as a preventive to the decay of sacks, canvass, cordage, &c. The solution acting on these in the same way as on timber, converting the fibres of cloth into an insoluble, inert, and indestructible compound, which cannot be removed by subsequent wet.

As the preparation of tanks and other materials necessary for the process, is attended with considerable expence, it will only answer to prepare these

where there is a considerable business to be done. In a hop district, where the cultivators would agree to have a quantity of poles, sacks, cordage, and canvass, made impervious to the weather, there only it would it be worth while to have a tank erected.

The expence of the process may be roughly stated at 20s. per load of 50 feet. Hop poles, containing nearly half a foot each, may be estimated at 2d. each for a saturation of the whole length.

There are other preparations for preserving poles, such as charring them at the bottom, which, when properly done, is a very efficacious way of preventing destruction in that part, as it prevents the absorption of moisture. Gas tar is also a very excellent preservative to wood as well as to sacking; the end of poles might be put into the warm tar, and in a few hours would be completely saturated with it; this is a proof against worms, as well as a preventive to decay.

All poles will be better for having the bark shaved off, as it prevents decay, as well as removes a great harbour for insects.

The loss of poles per annum, is generally calculated at about one-sixth of the quantity required per acre; so that in six years a complete renewal of the quantity will have been required; but this much depends on the quality of the poles and their preservation; chesnut poles have been known to last for twenty years, the tops will break off, and they will wear down to the very heart of the wood; even Scotch fir poles have been known to last fifteen years when charred all over. A fir plantation having been fired at Frimley, some of the poles were to be seen at Badshot farm, Farnham, fifteen years afterwards.

EXPENCES OF CULTIVATING AN ACRE OF HOP-GROUND.

The first cost of planting, as well as the yearly expence of after culture, will vary according to local

circumstances, such as the price of labour, the nature of the soil, rent and taxes.

The highest prices are here stated for executing the work in the best manner, agreeable to the recommendations contained in the work.

Expence of the first Year in forming a Garden.

	£	s.	d.
Trenching one acre of light soil, breaking the under-spit, at 6d. per rod.....	4	0	0
Manuring, at 20 loads per acre, and spreading, 3s. 6d.	3	10	0
Cost of 1,440 plants, one to a hill, at 5 ft. 6 inches distances, at 2s. 6d. per hundred.....	1	16	0
Labour, setting out and planting	1	10	0
Cost of 1,440 6 ft. poles, and labour poling, 5s. per hundred	3	12	0
Half the year's rent and taxes, at 50s.....	1	5	0
First cost per acre	£15	13	0

N. B. Half a year's rent is considered as chargeable on a crop of potatoes which may be obtained the first year, 1,440 whole potatoes being placed in the centre of the diagonals; from these 400 bushels have been obtained.—Drilled turnips or peas, may be had recourse to, to pay the first year's expences of tillage.

Yearly Expence of an Acre.

	£	s.	d.
Interest and loss on the first year's expence at 7½ per cent.....	1	1	0
Rent of the ground.....	2	10	0
Rates and taxes	1	10	0
Tithe on 6 cwt.	1	10	0
First digging the ground	1	0	0
A yearly dunging.....	2	10	0
Cutting and trimming the hills	0	5	0
Poling, two poles to a hill, 2,880, and pointing new ones	0	12	0
One-sixth expence of 2,880 poles, and cartage to ground.....	5	15	0
Tying the bine, clearing and earthing hills.....	0	10	0
Horse hoeing three times, at 2s. 6d.	0	7	6
Becking and making good round the hills	0	2	6
Additional poles, and making good injuries from wind	0	5	0
Expences up to the picking time.....	£17	8	0

Expences up to the picking time—(<i>Brought forward</i>)	£17	8	0
Cutting the bine, pulling and stripping poles	0	7	0
Picking 80 bushels for 1 cwt., and 6 cwt. being taken as the average growth per acre, at per bushel 1½d.	3	0	0
Measuring, tallying, and taking to the kiln	1	0	0
Waste of cloths and baskets	0	7	0
Drying and removing 6 cwt., labour	0	5	0
Bagging 6 cwt. 7s., expence of bags 14s.	1	1	0
Firing, 7s., and rent of kiln, insurance, &c. 50s.	2	17	0
Carriage to the market, of 6 cwt.	0	10	0
Stacking the poles	0	3	0
* Duty on 6 cwt. at 18s. 8d. per cwt.	5	12	0
	<hr/> £32 10 0 <hr/>		

The produce computed at 6 cwt., the average cost is £5 8s. per cwt.

It is a practice in some parts to let all the labour for the year to one man, who may have a family, for £3 10s. per acre, this is without the picking and drying; the practice has its advocates and objectors, much depends on the character and attention of the man undertaking the work.

The Expences of 1 cwt. of hops, if purchased on the Poles, may be stated thus :—

	£	s.	d.
The duty	0	18	8
Picking	0	10	0
Bags	0	1	4
Drying	0	5	0
Bagging	0	0	9
Cartage	0	2	0
Sale	0	1	0
	<hr/> £1 18 9 <hr/>		

* *Duty on Hops.*—By the Act of William IV., 1831, the mode of clearing off the duties on hops is altered, by fixing two days in the year for payment; viz. half on the 1st of March after they are charged, and the other half on the 1st of October following.

The Labour Expences of cultivating an Acre of Hop-ground, as now let to the Workmen in the neighbourhood of Farnham, may be explained thus:—

	£	s.	d.
Digging an acre	1	0	0
Spreading the dung.....	0	2	6
Cutting the roots.....	0	5	0
Throwing the poles and sorting.....	0	5	0
Pointing and setting poles	0	7	0
Tyeing and trimming	0	8	0
Becking once.....	0	8	0
Hilling	0	7	0
Hoeing once.....	0	2	6
Stacking the poles.....	0	5	0
	£3	10	0

A hop-planter in Mid-Kent has favoured the Author with the expences and produce of four acres of hops in the year 1836, on which occasion he was very successful.

	£	s.	d.	
Rent and taxes on 4 acres, at 40s...	8	0	0	
Culture, labour only 50s.....	10	0	0	
Repair of poles	4	0	0	
Dunging, at 40s.	8	0	0	
Picking 4,332 bushels, at 9 for 1s.	23	15	0	
Drying, labour only	3	12	0	
39 Pockets, making, marking, sifting, and treading, at 1s. 2d.	2	5	6	} = 11s. per cwt.
Pole pullers, measurer, and expences	4	16	0	
Pocket cloth	4	0	0	
Fuel of charcoal.....	6	10	6	} = 3s. 6d. per cwt.
Sulphur and lime	0	17	6	
Rent of kiln	4	0	0	
Interest on the first year's expenditure	4	0	0	
Duty on 64 cwt. at 18s. 8d.	59	14	0	
Tithe	4	0	0	
	£147	10	6	

Produce sold 64 cwt. at £6 10s. = £416. — 4,332 bushels yielded 64 cwt., which was equal to 68 bushels per cwt. The hops were good, having many male plants about the ground.

The weight of hops will vary in the same ground according to the seasons. At Farnham, in the year

1836, 77 bushels were required to make 1 cwt.; whereas, the following year, 68 bushels only was required to make the same weight of dried hops, from the same ground.

TITHE.

Under the head of expence in the culture, may be considered the iniquitous tax of tithe; for where it is taken in kind, that is, the tenth of the picking taken away by the tithe-owner, it is a most tyrannical and iniquitous impost. The legislature ought not to have suffered such gross impositions to have been practised on the growers for so long a period; it ought long since to have interfered in all cases of hop-ground being tithed to the strict letter of the tenth of the produce; for it never was contemplated, or intended, when the tithe of the earth's produce was first imposed for the benefit of the clergy, the church, or poor, that the tenth produce arising from the investment of so much capital, such great yearly outlay on every acre of ground, was to be taken or filched by the church, or the nominee of the church; indeed, it is preposterous, that a tenth of the return from the purchase of poles, (*a tenth of the poles having already been taken in the wood*), a tenth on the dunging, expence of planting, and even picking, should be taken away for their benefit.

The government has at length interfered and passed a law for the commutation of all tithe, dated August, 1836; in this law are some clauses expressly referring to hops, which are given as follows:—

Sect. 40.—How the Tithe of Hops, Fruit, and Garden produce is to be valued.

“ And be it enacted, that in case any of the lands in the parish shall be hop-ground, orchards, or gardens, and notice shall be given by the owner thereof to the commissioners, or assisting commissioner acting in that behalf, that the tithes thereof should be sepa-

rately valued; the commissioner or assistant shall estimate the value of the tithes thereof according to the average rate of composition for the tithe of hops, fruit, and garden produce respectively, during seven years preceding Christmas in the year 1835*, within a district, to be assigned in each case by the commissioner or assistant, and estimating the same as chargeable to all parliamentary, parochial, county and other rates, charges and assessments to which the said tithes are liable, and shall add the value so estimated to the value of the other tithes of the parish ascertained as aforesaid."

By this section it will be seen, that it is the owner of the hop or fruit ground who must give notice to the commissioners of a separate valuation of the land. The owners of these grounds should not omit to give this notice, in order to avail themselves of the change of cultivation, as explained in the following section.

42. Provision for the Change of Culture of Hop-grounds and Market-gardens.

"And be it enacted, that the amount which shall be charged by any such apportionment as hereinafter provided, upon any hop-ground or market-garden in any district so to be assigned, shall be distinguished into two parts, which shall be called the ordinary charge and the extraordinary charge, and the extraordinary charge shall be a rate per imperial acre, and so in proportion for less quantities of ground, according to the discretion of the valuers, or commissioners, or assistant, by whom the apportionment shall be made as aforesaid; and lands whereof the tithes shall have been commuted under this act, and which shall cease to be cultivated as hop-ground or market-gar-

* A tithe-collector at Farnham has been heard to say, his lay-employer will not be satisfied at being commuted with at the seven year's average; but the law is peremptory. The Author would shew it be so, as an appraiser.

dens, at any time after such commutation, shall be charged after the 31st December next following such change of cultivation only with the ordinary charge upon such lands; and all lands in any such district the tithes whereof shall have been commuted under this act, and which shall be newly cultivated as hop-grounds or market-gardens at any time after such commutation, shall be charged with an additional amount of rent-charge per imperial acre, equal to the extraordinary charge per acre upon hop-grounds or gardens respectively in that district; provided always that no such additional amount shall be charged or payable during the first year, and half only of such additional amount during the second year of such new cultivation; and an additional rent-charge by way of extraordinary charge upon hop-grounds and gardens, newly cultivated as such beyond the limits of every district in which any extraordinary charge for hop-ground or gardens respectively shall have been distinguished as aforesaid at the time of the commutation, shall be charged by the commissioners at the time of such new cultivation, upon the request of any person interested therein, if such new cultivation shall have taken place during the continuation of the commission of the said commissioners, and after the expiration of the commission shall be charged in such manner and by such authority as parliament shall direct, and shall be payable and recoverable in like manner, and subject to the same incidents in all respects as an extraordinary charge, charged upon any hop-grounds or market-gardens at the time of commutation."

Remarks on the Tithe Bill.

Sect. 17, Requires one-fourth of tithe or land-owners to call a public meeting, and two-thirds to agree on the sum to be paid in lieu of tithe, which will bind the rest.

21. The agreement must contain the amount of all lands, describing the tillage, if wood, or common, if

a modus or composition has been paid, to whom, and if exempt on what grounds.

26. The consent of patron required to the agreement, in whom is the presentation if vacant, if it is in a bishop then the Lords of Treasury consent required.

37. The average of seven years preceding Christmas, 1835, if any part compounded for, the amount shall be considered as the clear value of tithes, any diminished amount in any one year, shall be taken as the value, and to include all rates and taxes.

38. If owner of tithes give notice that average of seven years will not fairly represent the sum to be permanently paid, the commissioners may diminish or increase one-fifth on the previous ascertained value; if composition has been made for a long time a separate value may be made; notice of how to be made to be given by May, 1838, and laid before Parliament.

40. On hop-grounds. (*As detailed.*)

41. Of coppice-wood, notice may be given of separate value, by either payer or owner of tithe; rules for valuations to be made by May, 1838.

42. On hop and garden-ground. (*As detailed.*)

58. By request of land-owner, before apportionment, special valuation may be made, and charge put on particular lands to the exclusion of other, by consent of person entitled to rent-charge, extra expence to be borne by party requiring it, the value of land on which charge is made, must be three times the value of rent-charge.

72. Future alterations of apportionment, subsequent to confirmation, the owner of any land charged with rent-charge, desirous of alteration, must apply to commissioners of land-tax, to alter in such manner to the exclusion of such lands as may be required, with consent of two justices; and will be valid as if made by tithe-commissioners, and considered as an

amendment of the original, expences of such alteration to be paid by land-owner requiring the same.

By this act it does appear, that unless a notice is given by the tithe-payer before commutation, the amount will be made final by the commissioners (sec. 40), any alteration of tillage will not alter the amount, unless demanded by the tithe-payer, (sec. 72), in coppice-wood only, the owner of tithe can demand a separate valuation (sec. 41).

ON THE CONSTRUCTION OF KILNS FOR DRYING HOPS.

A most important point in the preparation of hops for market is to have them judiciously dried; and in addition to the observations made under the head "Preservation of Hops," it may be mentioned that it is a material point to be borne in mind, that, exposed to the sun's rays, they will become bleached, and lose their natural greenish yellow hue; therefore no windows should be kept open to the sun's light. A quick draft is absolutely necessary in the drying, particularly at the first laying on the hops, they being in a humid state; to increase this draft some kilns are constructed with holes to open at command through the front brick work, between the fires, and close to the ground. Every particle of air which passes through the layer of hops is presumed to carry away a particle of the humidity, which should be driven as quick as possible out at the cowl, or vent at the top of the drying house.

In making pale malt it is usual to have additional currents of air at the command of the dryer, so should it be in making pale hops; high-dried malt or hops is no other than a partial burning, and ought to be avoided, for colour is no criterion of strength.

We have now to inquire into the mechanical operations, and on the best construction of kilns. The surest method of attaining perfection in any art is to

have a thorough knowledge of the deficiency before attempting a remedy.

POINTS TO BE OBTAINED IN DRYING HOPS.

1st. They should retain a natural greenish yellow hue, without the use of sulphur, approaching to a grass or sap green, the autumnal tint of many vegetable leaves.

2nd. The seeds should be dry and hard, and the stalk brittle.

3rd. When on the kiln the heat should be uniform over the whole floor, and the upper part of the layer of hops should not be damped by any fall from the the condensed moisture passing off at the cowl or vent.

4th. When beaten on the kiln floor with a stick they should rebound up with the stroke, and not lie dead: when they are lively and the stalks are brittle, breaking to dust under the hand, the drying is effected.

The sooner these objects are gained the better will be the sample, hence the necessity of well constructed kilns.

The principle of drying, is, to drive a current of hot air through the layer of hops, and to obtain this, economy, dispatch, and effect are points to be regarded. The fire place should be low, that the air, cooled by the ground, be made to pass through the fire; this will keep up a quick draught; but there should be shutters to the openings in the outer walls of the building to regulate the supply of air, according as the wind may blow, and the hot air should be passed through a grating to disperse it under the hop floor; or by a brick horse, having a stone on the top, as a spark plate, and holes on the sides for dispersion of the heated air. A wire gauze bent over the fire would answer this purpose, and act as the gauze to Davy's safety lamp, preventing a flame going beyond it.

Barns, sheds, malt-kilns, and other buildings are often converted into drying houses for hops, and where the area is large much loss takes place in fuel, as well as by reduction in the weight of the article, and injury to the colour.

When it is considered that 100 sacks of charcoal is required to dry a ton of hops, and that the whole expense of drying amounts to between 10 and 15 shillings per cwt., the necessity of saving expense will be manifest.

Malt kilns are used for drying hops, but the construction of a building calculated for stopping the vegetation of barley, is ill adapted for drying hops. The faults of malt kilns for this purpose, are, that there is too great a space between the level of the floor and the commencement of the roof, or cowl hopper, and the roof does not gather or slope in quick enough; the heat, therefore, is not sufficiently condensed, and much is lost.

The openings into the kiln floor are not sufficiently enclosed, glass windows are sometimes within the space, which let off much heat, and injure the colour.

The following are the old methods of drying :— Kilns of old construction are generally long buildings, about 18 feet wide, with as many fire places as the extent of ground may call for; every two or three acres will require a kiln fire to get the hops dried off quickly, for they must go directly from the garden to the kiln floor. The floors are made 10 or 12 feet square, united, and are placed on one side of the building having a passage floor of 6 or 8 feet wide on the other side. One end of the building has a floor for receiving the green hops, and the other end a larger floor for placing the dried ones, until they are bagged. Each drying floor or kiln has a door communicating with the passage.

The hopper kilns when designed properly are constructed like two Pyramids placed base to base; near the apex of the under one is placed the fire, and on

the apex of the other is placed the cowl for ventilation; the floor should be placed 12 inches below the joining of the bases, thus—



The old kiln floors are generally constructed with wooden bars placed within an inch of each other, and a hair cloth laid thereon; these bars should be supported on a triangular cut beam, or this floor may be constructed with iron rods or kiln tiles.

The fire place should be placed on the south west side, the prevailing wind being from that quarter in the autumn, and all the air which passes up through the layer of hops should be made to pass either through the fire, by the ash hole, or so close over the top of it as to become properly heated, a check to the draft being given by a brick disperser, with a top spark plate.

By this precaution the air becomes rarified, and passes quickly through the hops, taking with it the aqueous particles to the cowl.

The material for combustion in these kilns must be either coke, charcoal, or a coal which does not yield smoke, but this last is very apt to give an offensive odour to the hops. The chemical properties of these matters have already been inquired into; but it may here be again remarked with propriety, that charcoal in combustion imbibes a great quantity of the oxygen of the air, and forms carbonic acid gas, which coming in contact with the hops gives a degree of weight nearly equal to the quantity of water driven away, and also imparts to them a greenish hue (particularly

if the charcoal is damped) ; for the gas above-mentioned, when at the temperature of the atmosphere, approaches the specific gravity of water, being the heaviest of the known gases ; it is the choak damp of rats and wells.

Turf firing.—An analysis has been given under the head of "Chemistry" of the different qualities of wood for charcoal ; but in France some experiments have been made, which go to prove that charred turf is a much stronger fire than charred wood, in the proportion of 3 to 5, the turf lasting as a fire for four hours, when the same weight of charcoal was consumed in two hours. The charred turf produces more heat than charcoal, because, as it wastes less, it contributes to the decomposition of a greater quantity of air.

The turf is charred by means of an oven, and is baked to a cinder ; in this state it is found to contain liver of sulphur, and sulphate of lime with silice ; hence this kind of charcoal would be the best for drying hops.

FURNACES.

A cast iron furnace has been constructed for these old kilns so as to burn any material, and by which the hot air formed round the fire is driven up through the layer of hops, and the smoke carried off through a copper pipe.

A patent has lately been taken out for a furnace, which is called a carbonized furnace, and respecting which the party has published a list of testimonials speaking extravagantly in praise of the saving in fuel it effects, by consuming all the smoke.

It may be here observed that in almost all furnaces it is desirable to place the fuel in small quantities near the entrance at first, so that the benefit of the smoke may be obtained during combustion in its unavoidable passage to the vent or chimney ; the fuel may be then thrust forward to make room

for fresh supplies. This point, although involving great economy, is too little attended to, and yet it contains the true principle of the consumption of smoke. All furnaces should be supplied in this way, which burn coal.

The furnaces are in some parts constructed in a simple manner by building a brick frame in the middle of the house, about one foot from the ground; iron bars are placed, around which a brick curb rises about six inches, leaving one side open for removal of cinders; if the hop floor is seven or eight feet above the fire, no spark plate or reverberator will be required; but if not of sufficient height, an iron plate must be suspended over the fire to diffuse the heat; the supply of air to the fire should be obtained as near the surface of the ground as possible, and under the level of the fire place, and if obtained under the surface it would be the better adapted to give energy to the fire, which may consist of mixed charcoal and coke, or coal.

Instead of a brick enclosure for the fire, iron plates have been constructed on iron legs, that the air coming in contact with the iron may become heated.

But the greatest improvement that has lately been made in the construction of furnaces for drying hops or grain, and for obtaining a quantity of heated air, has been that constructed by Mr. R. Brown, of Maidstone, who has taken out a patent for the invention; it consists of an iron frame about 2 feet square 18 inches high, placed on a frame, which communicates with three air drains to the outside of the drying house; the middle drain supplies air to the fire place, the other two supplies air to chambers on each side of the fire: these chambers are surmounted with four air chimneys occupying the four corners of the frame, each having a damper flap on the side, to be regulated as desired; over the fire there is a raised vent, having a top to be let up and down by a chain and weight; this acts as a spark plate and diffuser of heat; there

is also a flap over the fire and a window of talc in front, to see the state of the fire; the air drains are supplied with dampers outside, thus a command on the hot air is obtained, and may be totally excluded in a minute of time, as is desired in the exchange of dried to fresh hops on the floor. A pan is provided to be placed over the fire-flue for dissipation of sulphur. The price of this furnace is 25*l.* complete. The saving of fuel is very great; the whole frame may be removed when the building is not required for drying purposes, and a window being placed in the door of the house, and a thermometer hung within, to be seen outside, would enable the dryer to regulate the heat to an even temperature, or as desired, having the command of the outer dampers; this he could do without opening the door of the house, which occasions a rush of cool air through the hops, and condenses the vapour against the roof or cowl, which would fall back on the hops.

In constructing a hop oast, care should be taken not to have any plastering of lime above the floor of the hops, or in any situation where the sulphuric acid formed in burning sulphur below, can possibly come in contact with the lime, for if it does, it will form a sulphate of lime and fall in powder on the hops; a mixture of clay and sand must form the plastering.

The fuel that is used in an open kiln has much to do with the colour of the sample. It has been shown in the chemical inquiry, that sulphur has a most surprising effect, it will make the brownest hops of a light yellow colour, and hence all firing which contains sulphur will also tend to that result. The Welch coal or culm having little bitumen gives out but little smoke, but it contains iron in union with sulphur, as Pyrites, known by the metallic shining quality of the breakage. This material in combustion will give colour to the hops. The coke, which is the cinder of coal, contains but little sulphur, partaking more the nature of charcoal, mixed up with earthy matters. The

nature of ehareoal has already been described, being the same as the most valuable of minerals, viz., the diamond ; both consist of earbon ; the ehareoal may therefore be termed the black diamond.

The advantages of these old pyramidieal kilns, are, that the heated air is confined to the square enelosed spae, that if a small quantity of hops is to be dried the heat is confined to one space or square, and not dispersed over the range of spaces allotted to many fires ; no stagnant air can remain, the space being no more than is absolutely neecessary for the current and dispersion of the air ; moreover there is a greater space left between the kiln fires for stowage of firing, and other materials, when the kilns are not in use.

By using ehareoal for firing, there need not be any bottom grate bars, but the fire may be placed on the flat brickwork, whereas if eulm or eoke is used, it is neecessary for suecessful combustion, that there be a grating and an ash hole for the refuse to fall into.

EXTRA FLOORS TO KILNS.

A double floor is sometimes contrived where there is room, that is, another hop floor is placed at about six feet from the lower one, to take the damp hops at their first coming from the garden, and prepare them for falling on the floor below, perhaps half-dried ; the hops on the lower floor ought to be partly dried before the upper floor is covered, so as not to be any impediment to the passing off of the first moisture—experience will best teach how to manage these upper floors. Camomile flowers are dried in a similar way, by having trays one above another, with canvass bottoms laid on brackets on the sides of a drying room. The object of all dryings is to get a quick current of air to pass amongst the petals out of the rays of the sun.

There is a kiln constructed by a gentleman at Farnham of a novel, yet well arranged eharaeter ; it is a building about 36 yards long by 12 yards wide, including a passage around, about 2 yards wide ; the

inner building consists of four fires at each end, and a double stove between them in the centre; the lower part is used in the season as a sleeping place for the pickers, over which is the store floor for the dried hops; the pickers have also the use of the back, upper and lower passages, and the ends, which have fire places for their use. Over each of the eight charcoal fires there are four trays, 10 feet by 8 feet, having horse hair bottoms, the lower one 10 inches deep, the others 6 inches; the lower one receives the contents of the two next above when the hops are in a half-dried state, and the top tray is shifted next to the bottom one, thus leaving two trays to be filled with the fresh gathered hops; when the hops in the lower tray are sufficiently dried they are emptied into cloths and taken to the centre store; thus there is a continued stream from the garden to the top trays, from the top to the bottom, and to the store, requiring two men to each four sets of trays, which are placed opposite one another with a ten foot passage between them. In working this kiln there is a great saving of firing, but an additional expenditure of labour; this latter is of great importance at the busy season of picking, therefore this construction of trays will have its advocates where there are plenty of labourers and a scarcity of firing; but where otherwise situated this method of drying will be subject to great objections.

DRYING WITH HOT WATER.

Instead of air passing through, or over an open fire, it is now contrived, and adopted in some parts of Kent, to have a set of metal pipes placed within 12 inches of the hop floor, running to and fro under it, at distances of about 6 inches from each other, and kept hot by a continual flow of boiling water; thus the air coming in contact with the hot pipes, is heated and passes through the hops above. A boiler with a dome head, from which the water and steam passes in

a boiling state, is fixed, up nearly level with the under side of the hop floor, and the water, after passing through the pipes, is cooled and again supplies the bottom of the boiler; thus, by means of the fire, and a safety valve on the top of the boiler, a continual stream of hot water and steam is kept up under the hops. This is a clean method of drying, and if the air is properly checked from passing upwards without coming in contact with the pipes, it is likely to answer the simple drying purpose, but it will have no effect in restoring the colour, if they are at all brown, for which sulphur must be used.

On the score of economy, this method will have its advocates, as any kind of fuel will answer; of course the first fitting up will be expensive. The apparatus would be applicable to heating a green house, during the winter season, and might be removed for that purpose, as it is only during the few weeks of drying, that they would be required in the oast house. A green house, might be constructed at the back of the drying house, and the pipes shifted, or another set of pipes adjusted to the same boiler; but this process of drying with a current of hot water, is very questionable as to its success.

IMPROVED METHOD OF DRYING BY MEANS OF A
CIRCULAR OAST HOUSE, A COCKLE FURNACE, AND
A DAMPER CAP COWL.

The advantages of this construction are, 1st: That any kind of fuel may be used; 2nd. The hops are dried quicker, as a great surface of hot brick work and iron plates are offered to the air; 3rd. A collection of hot air may be formed around the cockle furnace and conveyed by means of pipes to any part of the floor which may not dry so fast as other parts; but no air ought to be admitted, except what passes around the flue, and chambers prepared for the purpose for admittance under the floor; doors may be contrived on each side of the furnace. By the word

cockle, is to be understood that the flues wind round about the house, that is, twisted, which flues, offer great facilities for forming a highly rarified air.

The best construction of this building is a circular form, of about 20 feet diameter, placed in the middle of a hop floor so constructed that the green hops may be placed at one end, and the dry ones at the other; the building should be constructed of brick, and being circular, 9 inch thick will be sufficient; a circular form encloses within its walls, a greater space, than the like quantity of walling can, of any other form, in the same way that a circular stack has the least quantity of outside. In the lower part there should be two or three windows, placed in different positions, to be regulated with shutters or louver boards, according to the direction of the wind; the lower part should be of sufficient height to admit of a double winding of the flues, which should pass through the centre and around the sides, to a chimney opposite the fire place, having proper dampers and stops for excessive drafts; of course the more windings there are, the more hot surface will be exposed to the current of air.

The drying floor, may be within a foot of the eaves' roof, which will form the hopper to the cowl. The floor should be formed with iron ties, and round iron rods for the hair cloth to lay upon, or an iron floor may be laid cast in plates, with counter sunk holes for the hot air to pass through, these counter-sinkings should be made to a depth to be within an eighth of an inch of the surface, otherwise they will get stopped up by the dust and seed; or, the floor might be laid with kiln tiles such as are used for malt kilns. Either iron, zinc, or earthen plates for the floor, have an advantage over hair cloth, by their retaining a degree of heat given to them, and assimilate in some measure to the drying of tea in China.

On this floor a layer of hops from 18 inches to 2 feet thick may be placed, and, in the course of a less

number, than the usual hours, they will be dried in a superior manner. The roof gathering at 12 or 18 inches above the floor, forms a reverberator, and the top of the layer gets dried as soon as the lower part; the watery particles, also meet with no obstruction and pass readily off at the cowl, which should be contrived to give the greatest vent when the hops are first laid on, and when the watery particles are escaping, after which the draft may be checked, by the improved cowl which will be next described. After the aqueous portion of moisture has passed off, the sap juices have to be expelled, or so dried up and concentrated that the least weight may be lost, and yet so sufficiently dried, as not to give rise to mouldiness, or mustiness in the bag. When there is a great space left over the hops, the aqueous particles are apt to get condensed, and fall back on top of the layer of hops, and keeps them damp to the end of the drying.

The direction of the wind or draft of the kiln, will generally occasion one part of a floor to be hotter than another, but not so much with circular kilns as with square ones; when this is the case, it must be altered by opening or closing the windows, or shifting the opening at the cowl, altering the hot air pipes, or putting a thickness of hair cloth where the floor gets too hot.

The inside of the building, above the floor at least, ought to be plastered that the radiations of the heat may be cast off and not absorbed.

These circular oasts may be constructed in an economical manner, and will be found to have no cold corners; the roof rising so near the floor, and of a very sharp pitch, will require no other ties than at the floor. The cowl may be constructed of light materials, as zinc or iron plate, agreeable to the following description.

THE COWL OF IMPROVED CONSTRUCTION.

Mr. Perkins of Herts, obtained from the Society of Arts in 1827, their large silver medal for his improvements in the construction of a cowl for oast houses.

The common cowl for a kiln, is a long conical cap, open on one side, or one third of the circumference, and having a vane or arm so fixed, that as the wind shifts, the cowl shall turn on its spindle, and always present the boarded or closed side to the weather. This prevents drifting rain from beating in; but in showers when the wind is still, the wet readily finds its way, and if the floor be loaded with malt or hops, retards the drying process, and if empty it injures the floor; it also prevents the accurate regulation of the fire, except by varying the quantity of fuel.

Mr. Perkins's Cap Cowl, enables the ventilation to be opened, or if necessary entirely closed. Felix Booth, Esq., of Brentford, has one fixed over his malt-house, and he has reported, that a great saving in fuel has resulted from its use, and that the malt has been benefited by the facility, which the invention affords, of regulating and varying the heat according to the dryness of the malt and other circumstances.

To give a proper description of this cowl will be difficult without a drawing of reference, but it may be briefly stated, that it is a circular cap cowl, to be raised by means of a wheel, and a weight as a counterpoise, revolving with the wind, and capable of being closed at the opening. The aperture may therefore be regulated according to the weather and atmosphere, or the state of the fire or hops; consequently it acts as a damper, and will regulate the draft agreeable to the desire of the dryer.

Similar drying houses to the one above described, have been constructed in Kent under the inspection of the author of this work; they have also been used in the neighbourhood of Farnham, and have been found

to answer the objects desired, viz., a quick process, economy in fuel, retention of colour and weight.

The Author will have pleasure in attending any gentleman who may wish to erect kilns or crows on improved principles, or of altering old ones, and would furnish Designs and Specifications for the work.

The Author has now brought his work to a close, and it is hoped, has pointed out some practical improvements; attention and solicitude has not been wanting to make the work complete; the subject has been viewed generally, as well as analytically, and a comprehensive view taken of the whole, for the advantage of those whose minds will unbend from their old methods; and if the observations lead to practical improvements, the intention of the Author's publication will be answered. It will be seen that the customary practices have not been held sacred, because they were old, but have been fearlessly investigated, to ascertain, if they will stand the test of examination, or if founded on correct principles. Many remarks have been hazarded, because the subject had never been before treated in a comprehensive and scientific manner; some of the higher branches of the subject having been hid in clouds of mystery, and success or miscarriage, has been attributed to fortune, as if, there was not a natural cause for all sub-lunary events.

The experienced hop grower will probably be loth to give up his usual practices, however defective his data may be, and any attempt at innovation on his general routine, will, probably, be adhered to the stronger, like the traveller who was required to give up his cloak in a cold wind, he will hug it the closer.

It is hoped, however, that the hints thrown out in this work, will be allowed a fair examination, and that they may tend to place the culture of hops, on principles more scientific, therefore more ra-

tional, and more in accordance with the dictates of nature.

“ Those who come to inquire after knowledge with a mind to scorn, shall be sure to find matter for their humour, but none for their instruction.”

—“ If Men would bring light of invention, and not fire-brands of contradiction, knowledge would infinitely increase.”

BACON.

NOTES

TO

THE HOP FARMER.

NOTE TO PAGE 4.

Calculation on the Hop Duty per cwt.

	£	s.	d.
1734. Original duty, 1d. per lb.	0	9	4
Three 5 per cents. on this amount	0	1	4 $\frac{4}{20}$
	0	10	8 $\frac{4}{20}$
1802. New duty, at 1 $\frac{1}{4}$ d. per lb. . .	0	12	7 $\frac{16}{20}$
	£1	3	4
1805. Duty reduced $\frac{1}{2}$ d. per lb.	0	4	8
Present duty per cwt.	0	18	8 = 2d. per lb.

There are a greater number of persons surveyed by the excise for hops than any other trade in Britain growing an exciseable article, except it may be malt, viz. between seven and eight thousand growers.

The mode of charging and collecting these duties is different from any other exciseable article; the gathering and preparing for sale, and the weighing is completed in five or six weeks, the whole being charged to the parties as soon as it is weighed; assistant officers are therefore obliged to be engaged in the districts, under the direction of the supervisor, 270 persons are often engaged extra for these charges. The expences of the collection is but a small per centage on what the Government receives in a good year.

Out of the 55,422 acres in the culture of hops in the year 1836 there were 50,366 acres in the districts of Rochester, Canterbury, Sussex, Hereford, and Worcester.

Mr. Ellis, of Barming, in the Rochester collection, is the largest grower of hops in the kingdom, having 474 acres in culture—in the Rochester and Sussex collections there are five other growers who cultivate 135 acres each on an average; but from 40 to 80

acres are the largest quantity under cultivation by one individual in the other great districts.

A drawback is allowed on exportation of hops grown at any period, but it has been recommended that the period from the growth to which the drawback should be restricted ought not to exceed three years; the drawbacks or allowances on the exportation of hops exceeds 6,000*l.* per annum for several past years, which is more than the average growth of the Hampshire district, including Farnham.

NOTE TO PAGE 5.

The average growth of Hops per acre in England, from 1807 to 1837.

Years.	Cwts. per acre, yearly average.	Cwts. per acre, 7 yrs. average.	Cwts. per acre, 28 yrs. aver- age.												
1807	4 88-100	5 58-100													
1808	12 20 "														
1809	3 10 "														
1810	3 58 "														
1811	7 62 "														
1812	1 47 "														
1813	6 20 "														
1814	6 44 "														
1815	5 47 "														
1816	1 95 "														
1817	2 68 "	5 48 "													
1818	7 65 "														
1819	8 64 "														
1820	5 14 "														
1821	6 31 "														
1822	8 71 "														
1823	1 17 "														
1824	6 38 "														
1825	97 "														
1826	9 94 "								5 62 "						
1827	5 30 "														
1828	6 62 "														
1829	1 55 "														
1830	3 51 "														
1831	6 91 "														
1832	5 49 "														
1833	5 94 "														
1834	6 89 "														
1835	8 14 "														
1836	6 74 "	5 31 "													
1837	"														
</															

Duty paid per acre for 28 years.

£ s. d.
5 2 8

at 18s. 3d. = 5 2 8

NOTE TO PAGE 50.

On Earths, and Bases of Vegetables.—There are but very few surface soils which when analyzed are not found to contain something besides, earths, metals, and acids, this by former chemists was called vegetable matter, but by later ones, is considered to be a natural manure, and is what renders the surface fertile. This matter is the residuum of animal and vegetable substances, and can be easily separated from the earths, it has been accurately analyzed and described by the first chemists of Europe, and called vegetable mould, but some chemists and writers on agriculture adopt the term *Humus*—which is a dark, unctuous, friable substance, nearly uniform in its appearance, and found to be compounded of oxygen, hydrogen, carbon and nitrogen; which are the elements and bases of all animal and vegetable substances. We are not, therefore, surprized at this *Humus* being the result of the slow decomposition of organic matter in the earth, it is found in the greatest abundance in rich garden mould, or old neglected dung hills; and is varied in its nature according to the qualities and nature of the materials from which it is formed, and the circumstances attending the decay. Being the result of organic decay, it cannot therefore be compounded chemically except by a similar process of decomposition and reformation; hence, those animals, only, which feed on both animal and vegetable substances can give it out as feces.

Besides the elements mentioned above, *humus* contains other matters in smaller quantities, viz., the phosphoric and sulphuric acids, combined with various bases: there are also found some earths and salts. *Humus* is considered to be the product of living matter and it is also the source of it. It affords food to organization, without it nothing material can have life, consequently the greater the number of living creatures, the more *humus* is formed; and the more *humus* the greater the supply of nourishment and life.

Every organic being in life adds to itself the raw materials of nature, and forms *humus*, which increases, as man, animals, and plants increase, in any portion of the earth. It is diminished by the process of vegetation, and wasted by being carried into great rivers, and into the ocean, and hence the necessity of husbanding the *humus* runnings from great towns; it is also carried off by the atmosphere, by the agency of the oxygen of the air, which converts a part of it into gaseous matter.

Humus in the state in which it is usually found in the earth, is not soluble in water, and we might have some difficulty in understanding how it can enter the minute vessels of plants, and pass upwards from the roots, but in this, as in every thing else, where we have to dive into the mysteries of nature, the evidence of design in the divine Author of Nature is manifest. *Humus* is insoluble and antiseptic; it resists further decomposition in itself, it remains for a long time in the earth unimpaired, but no

sooner is it brought into contact with the atmosphere, by the process of cultivation, than an action begins; part of its carbon uniting with the oxygen of the atmosphere, produces carbonic acid, which the green parts of plants readily absorb, while its hydrogen with oxygen, forms water, without which plants cannot live; and in very warm climates, where this process goes on more rapidly, the moisture thus produced, keeps up vegetable life, when rains and dews fail; but then fresh surfaces must be continually offered to the atmosphere for decomposition.

What remains of the humus becomes a *soluble* extract and in that state is taken up by the fibres of the roots: still changes are going on, the extract absorbs more oxygen, and becomes once more insoluble, in the form of a film, which Fourcroy calls vegetable albumen, and which contains a small portion of nitrogen, this inert matter again becomes active by being again brought to the surface by culture, the same process is repeated, viz., the formation of carbonic acid and water, and hence the great service of horse hoe culture with hops, as with grain, or other vegetable produce; and thus we see the great importance of humus, and of those rich manures, which are readily converted into it, when not immediately absorbed by plants. Of manures, the excrement of man, yields the greatest abundance of humus.

But this humus has still another property not before mentioned, which is highly important to fertility, for it converts stiff clays into porous earth, and consolidates loose sands more than any other ingredient, hence a soil with a portion of humus, is much more fertile than its appearance would lead one to expect. In this view of manures we see their uses in combination with surface tillage, which has been strenuously advocated in the course of this work on the hop; we see also that those manures which contain the most humus are the most lasting.

NOTE TO PAGE 57.

Seeds.—It has been remarked that hop seeds, after being boiled would vegetate, therefore to obtain the full virtue of the seed the oil and pungent bitter to be incorporated with the wort with which it is boiled, the seed ought to be sifted out of the hops, and crushed by being passed through a mill, previous to using them.

NOTE TO PAGE 59.

Varieties of Hop.—There is another raised by Mr. W. Paine at Farnham, having the appearance of the autumnal tint of the leaves, they are always "in the yellow leaf;" indeed their appearance, compared with the red bine, or black knots, is very striking, the one being a dark blue, while the other is a light yellow green; this variety of hop branches out very much, and yields a delicate coloured strobile.

NOTE TO PAGE 66.

BOTANY—*Lusus Naturæ*.—Some gentlemen hop-growers, and considerable cultivators at Farnham, have asserted they have seen a hop-hine having both male and female blossoms on it, or rather the complete hop at the knot of one portion, and the male anthers on other shoots at other joints of the same bine; a similar curiosity has been described to the Author by some gentlemen growers at Barming in Kent, but as the gentlemen were not sufficiently acquainted with the science of Botany to satisfy the Author, he must still have his doubts, the evidence not being sufficient; and as he never likes to look through other person's eyes, he asks to have this play of nature confirmed before he attempts its explanation.

NOTE TO PAGE 66.

Male Plants.—As an additional proof of the virtue and advantage of male plants in a hop-ground, it may be mentioned, that the Author, having examined some hops grown by the landlord of the City Arms, Hammersmith, in the year 1837, found in nearly each separate hop there were thirty seeds, and the strobiles well formed; a male plant being near where they were grown; yet at a quarter of a mile distant, Mr. Jordan, in the High-street, having some hops in his garden, there was scarce a single seed, the uttermost found being two in a hop, this garden was enclosed with a wall, and no male plant nearer than the one mentioned above.

NOTE TO PAGE 85.

Phalæna genus—Order, *Lepidoptera*.

The larva, which is seen in the picking season, and, indeed, may be seen in various situations until the middle of October, called (when found in the hop-ground) a "hop dog," is of a handsome description, $1\frac{1}{2}$ inch long, and exceedingly sensitive of touch; it is covered with long hairs, and on its back close tufts of hair of a yellow cast, the hinder part of the back is terminated with a tuft of longer red hairs, pointed like the tail of a pointer dog, between the yellow tufts and cross stripes on the body; the markings are a jet black, of a velvet appearance, which widen when it rolls itself into a ball. The mouth is furnished with a pair of jaws for devouring leaves; three pair of short legs in the fore part, and five pair in the hinder part of its length. The hairs on its body are a quarter of an inch long, and when touched at the extremity of them seem to give pain, and the head is gathered under the body as well as the hinder part, forming a ball of hairs in appearance.

About the middle of October this larva spins a yellow silk, and envelopes itself in a cocoon, changing to a chrysalis, having a thin membrane over the vital part similar to the silk-worm Pupa; indeed this may be classed amongst the numerous tribe of

Bombyces, to which the silk-worm Moth belongs. They feed on the green leaves of the hop, but are not numerous, and being handsomely marked are looked upon as a curiosity rather than viewed with disgust, as many caterpillars are.

NOTE TO PAGE 127.

Blissimere Hall Acre.—The rent and particulars of this mart not being correctly given, is corrected by stating the income of the year 1835.

		£	s.	d.
829½ Acres in cultivation	at 2d.....	6	18	3
1754 Pockets	at 6d.....	43	17	0
16 Feet frontage of hooth ..	at 1s. 3d....	1	0	0
139 Feet do.	at 2s. 6d....	17	7	6
868½ Feet do.	at 2s. 7d....	112	3	7½
		181	6	4½
Deduct expenses and arrears		42	9	3
		10)138	17	1½
Divided amongst ten proprietors, for } each person		£ 13	17	8

NOTE TO PAGE 131.

Preservation of Poles.—A gentleman in Scotland, (Mr. Menzies, of Closeburn, in Dumfriesshire,) has been in the practice for upwards of forty years of steeping Scotch fir in lime-water, after it is cut to the size wanted, and it has been found to last double the time similar wood has done, without such preparation; it would appear that, either the alkali of the lime neutralizes in some degree the albuminous matter of the soft wood, or that the water acts as a solvent, and extracts a part of it. A small quantity of lime is sufficient, for water will hold only a certain quantity of lime solvent in it without deposition, and ten days is an ample period for saturation. This is now proposed as a preservation for all hop-poles consisting of inferior woods, such as fir, alder, hirsch, heech, &c.; they should be previously stripped of their bark, pointed and cut to the lengths required. In addition to the lime, it has been recommended that a quantity of alum should also be dissolved in the water.

CORRECTIONS WANTED TO THE HOP FARMER.

Page 33, 3rd line, for *Tarleigh* read *Farleigh*.

34, 15th line, for *Bagshot* read *Badshot*.

40, 3d line from the bottom, for *Hedington* read *Headingham*.

74, bottom line, for *as* read *or*.

93, 3rd line, read *Arum*, or wake robin, *Phallus fatidus*,
or stink horns, *Uredo fatida*, or smut balls in wheat.

103, 18th line, for *breaking* read *becking*.

120, 20th line, for *bag* read *bags*.

21st line, for *poles* read *holes*.

133, Expences of 1 cwt. on the Poles, for Drying 5s. read 10s.

APPENDIX

TO

THE HOP FARMER.

After the preceding pages were prepared for the press, the author was favoured by Mr. Frederick Gray, of Alton, with the perusal of a very curious old book on hop culture, the only work on the subject of the hop exclusively he has ever seen ; and as it was published two hundred and fifty-eight years ago, he does not apprehend that any apology will be required for again calling the attention of the public and *the hop farmers* to the subject, particularly as many of the remarks are extremely trite and laconic. The work he has seen at Alton is probably the only one in existence ; he has therefore made some extracts from it, to show the progress of the culture.

The work is a thin octavo, in black letter, with rude wood cuts of the various operations in the hop garden. The Title is—

"A Perfitte Plattforme of a Hoppe Garden, and necessarie instructions for the making and mayntenaunce thereof, with notes and rules for reformation of all abuses commonly practised therein, very necessarie and expedient for all men to have which in any wise have to doe with Hoppes.

Now newly corrected and augmented by Reynolde Scot. Imprinted in London by Henrie Denham, dwelling in Pater-noster Rowe, at the Signe of the Starre.

1578.

Dedicated to The Right Worshipfull Mayster Willyam Lovelace, Esquire, Sergeaunt at the Lawe."

In the Epistle, Mayster Lovelace is advised to look about his house at Biddersden for a convenient plote to be applied for a Hoppe garden.

“The courtous man that lyeth in wayte to spare his halfepe nye, the sluggarde that sleepeth away oportunitye, and unskyfull that refuseth to learne the right order, maye happilye releasse the bitternesse of the Hoppe, but shall never savour the swetenesse thereof—and yet if Hoppes would be had vvith vvishes, or if any other commodities might be bought with desire, who would be better provided than these men, namely that these that make their provision lying in their beddes, or sitting by the fire, and in the end buye a great Kyte insteade of a little Larke, whose myndes voyde of vvisedome make their purses many times voyde of money and their doings voyde of effect.—The slothfull bodie that will not go to the plough in winter for colde shall begge in the summer for neede.

Soil.—“Such earth as shall be whyte and bare (that is to say) wholly cbalke or all sande lackying a myxture of perfyte earth, or if it be clayie, or so drye, as thereby it shall gape or coame in the summer, is naught for this, or any lyke purpose.—If you feal a clod to be very clammy the same is profitable Lande.—I can say nothng of Florentine’s experiment in digging a hole, and filling it up aguine, and by the swelling to judge of the strength, or by the gaping to define the weakness thereof, but I can say by sure experience, that a dry ground, if it be riche mealoe and gentle, is the soyle that seruth best for this purpose, and such a mould must either be sought out or else by coste and labour be provoked.—The heavvest grounde will bear the most weyght of boppes, I say so as it be a grounde apt for this purpose.

Situation.—“The grounde should be naturally defended by hill from the North and West wind rather than artificially guarded by Trees.

Produce.—“Upon every acre you maye erect seaven, eight, or nyne hundred hylles; upon every hill well ordered you shall have three pounds of Hoppes, at the least, on the four poles, 2½ pounds of these Hoppes will largelye serve for thebruing of one quarter of Mault.—100 pounds of these Hoppes are commonly worth xxvi shillings and viii pence, so as one acre of grounde and the third part of one man’s labour with small cost besides shall yealde unto him that ordereth the same well, fortie marks yearly, and that for ever.”

A Mark is equal to 13s. 4d., 40 marks=26l. 13s. 4d. 800 hills to an acre would be squares of 7 feet 3 inches; at 3 pounds to each hill would give a weight of 2,400lb., equal to 21 cwt. 48lb. of our present weight.

Uses.—"The Hoppes shall be wholesome for the body and pleasanter of verdure or taste, than such as be disorderly handled.—You cannot make above eight or nine gallons of indifferent ale out of one bushel of Mault, yet you may with assistance of Hoppe, draw xviii or xx Gallons of very good beere; neither is the hoppe more profitable to enlarge the quantity of your drinke, than necessary to prolong the continuance thereof, for if your Ale may endure a fortnight, your Beere through the benefit of the Hoppe shall continue a Month—and what grace it yieldeth to the taste all men may judge that have sense in their mouths—and if the controversie be betwixt beere and ale, which of them two shall have ye place of prebeminence; it sufficeth for the glorie and commendation of the beere, that here in our own Country Ale giveth place unto it; and that most part of our Countrymen doe abhorre and abandone Ale, as a lothsome drinke; In other nations, Beere is of great estimation, and of Strangers entertayned as their most choyce and delicate drinke, without the Hoppe, it wanteth his chiefe grace and best verdure.

Tillage and sort of Hop.—"The good and the kindly hoppe beareth a great and a greene stalke, a large a barde and a greene belle, it appeareth out of the ground naked without leaves until it be halfe a foote long.—Before winter you must Till with the Plough, if your ground is large, and if small with the spade, and this doe before every winter.—The more cost you bestow, the more you double your profit, and the nearer you resemble the trade of the Flemming.—You must have great regard that you cumber not your garden with Wylde Hoppes, the which is not determined from the goode by the rootes, but either by the fruite or by the stalke.—The fewer weedes you shall have on your ground the more hoppes you shall have.—I say your labour must be continuall from this time almost till the time of gathering.—Of the *Whyke Hoppe* the fruite is eyther altogether *seeds*, or else loose and light red belles; the stalke is redde; yet the best hoppe is sometimes the reddest in the stalke."

Planting, and Poles, and Growth.—Leave between every hole 3 yards or 8 feet at the least, that the plough may go between, otherwise it must be digged, a more tedious and costly business.—

"Your poales may be about XV or XVI foote long at the most, except your ground be very riche.—The hoppe never storketh kindlye untyle it reache higher than the poale, and return from it a yarde or two, for whylst it clyming upwards, the branches which growe out of the principall stalke growe little or nothing.—

"An acre may carry 150 Poles, the yearly supply of two load of poales wyll maintain.

"Some use to breake off the toppes of the Hoppes when they are grown 11 or 12 feet high, because they branch and stork ex-

ceedingly, I do not recommend these doings, yet doe they much better than such as wyll have theyr poales as longe as theyr hoppes. But if your poales be very long, and that he hoppe have not attained to the top thereof before the midst of July, you shale doe well then to break off the top of the same hoppe, for so shall the residue of the growing time serve to the maintenance and increase the branches.—The length of the hoppe (I say) little prevayleth to the storking or encrease of the hoppe.—Commonlye at St. Margaret's daye, Hoppes blowe, and at Lammas day they bell, but what time your hoppes begin to change colour, somewhat before Michaelmas, for then you shall perceive the seed to change colour and ware brown, you must gather them.—You had better to gather them early, rather than to late. In standing abroad they will shed theyr seede, wherein consisteth the chiefe virtue of the hop, and hereof I cannot warne you to often nor to earnestly. Wilowe poales should be burnt at bottom to prevent their growing."

Gathering.—*The gathering of Hops was at this time done with a hook and forked stick, without taking down the poles, the hills being raised two or three feet high.*

"It is not hurtfull greatly, though the smaller leaves be mingled with the hoppes, for in them is retayned great virtue, inasomuch as in Flanders they were sold in the year 1566 for XXVI shillings and VIII the hundred pounds, no one hoppe beying mingled with them!

"To plucke of the leaves, to the end that the hoppes may prosper the better, is also needlesse, and to no profit, and rather hyndereth than helpeth the growth of the hoppes for they are thereby deprived of that garment which nature hath necessarily prouided for them and cloathed them with."

Bags.—"The Hoppe sackes, brought out of Flanders, may be samples for you to work by, the stuffe is not Daintie wherewith they are made; the Loom is not costly wherein they are woven; the cunning not curious wherewith they are fashionod."

Disorders and Growth.—"The hoppe that liketh not his entertainment, namely his seat, his ground, his keeper, his dung, or the manner of his setting, comith up thick and rough in leaves, very like unto a nettle; and will be much bitten with a little black flye, who also will not harme unto good hoppes, who if she leave the leaf as full of holes as a nette, yet she seldome proceedeth to the utter destruction of the Hoppe, where the garden standeth hleake, the heat of summer will reform this matter.

The above are the extracts from this curious old book, which struck the Author as most applicable to his view of the subject; much of the work is occupied

by a description of the hills, the poles and the drying.

It will be observed that the Flemings are spoken of as guides for the English culture. About the period of this publication, it would appear, that the culture of hops, was first introduced into England from Flanders, viz. in the 20th year of the reign of Elizabeth; and we have no account of the culture in England, previous to the reign of that Queen, unless the following distich can be relied on:—(See page 2.)

“ Hops, reformation, Bays, and Beer
Came into England all in one year.”

“ *The whylde Hoppe, the fruite of which is altogether seede.*” This is no other than the male plant, and the view taken of them, by *Reynolde Scot*, in 1578, is very little improved upon, in some hop districts; where they are still called, “wild hops or seedling hills.” It could not have been expected, that in those early times, a knowledge of the sexual distinction of plants could be known; but yet it is wonderful that hop cultivators, should so generally, have remained ignorant of this law of nature until the present period.

In the year 1682 Sir Thomas Millington hinted at the sexual distinctions in plants; but it was not until 1735 that Linnæus published his *System of Nature*; and in 1750 appeared that letter which has been quoted in the Botanical part of this work on the hop, after which the sexual divisions of plants became universally assented to by all reflecting men. The ancients had observed a phenomenon with respect to the Palm tree, and Herodotus, the Greek Historian, describes them as abounding about Babylon, and that it was customary for the natives, in the culture of this plant, to assist the operations of nature, by gathering the flowers of the male tree, and carrying them to the female. Herodotus lived 484 years before Christ.

The chief virtue of the hop is spoken of, in the

above extracts, as eentered in the seed ; “ *wherein consisteth the chief virtue of the hoppe and hereof I cannot warne you to often, nor to earnestly.*” The brewers admit it, and the growers allow that the seed adds much to the weight, yet it is not sought after by the cultivators, in general!!

The dedication of this old book to “ Mayster William Lovelace, Esquire, of Beddersden, appears to relate to a family settled at Bethersden, a small village near Ashford, in Kent, where there is an account of one Sir Richard Lovelace having in former times, the reign of Henry 6th, founded a Chauntry for secular Priests.

The soil there is principally of the Weald clay, but some hops are cultivated on the sand stone hills adjoining—and in the lighter soils, there being 109 acres cultivated with hops, in the year 1835, within the parish.

Statistical Tables

TO

THE HOP FARMER.

CHAP. VIII.

Table of Square Measure for Land.

Square inches.	Square link.	Square foot.	Square yard.	Rod, or square perch.	Square chain.	Rod.	Acre.
62,7264	= 1						
144	= 2,2956	= 1					
1296	= 20,6611	= 9	= 1				
39204	= 625	= 272 $\frac{1}{4}$	= 30 $\frac{1}{4}$	= 1			
627264	= 10,000	= 4356	= 484	= 16	= 1		
1,568160	= 25,000	= 10890	= 1,210	= 40	= 2,5	= 1	
6,272,640	= 100,000	= 43,560	= 4,840	= 160	= 10	= 4	= 1

144 Inches make 1 Foot.

9 Feet „ 1 Yard.

272 $\frac{1}{4}$ Feet „ 1 Rod or Perch.

40 Rods „ 1 Rood.

4 Roods „ 1 Acre of Land.

640 Acres „ 1 Square Mile.

100 Acres „ 1 Hide of Land.

174,240 Squares of six Inches are 1 Acre.

4 Table of Squares in an Acre of Planting—of Hops, Potatoes, Dunging, Corn or Vegetables, from one foot square to 16 feet 6 square, or 1 rod.

Ft.	In.		Ft.	In.	In One Rod.	In One Acre.
1	0	by	1	0	272 $\frac{1}{4}$	43,560
1	0	"	1	6	181 $\frac{1}{2}$	29,040
1	0	"	2	0	136	21,780
1	6	"	1	6	121	19,360
1	6	"	2	0	105	16,837
1	6	"	2	6	72 $\frac{3}{4}$	11,616
2	0	"	2	0	68	10,890
2	0	"	2	6	54	8,712
2	0	"	3	0	45 $\frac{1}{2}$	7,260
2	6	"	2	6	43 $\frac{1}{2}$	6,902
2	6	"	3	0	36 $\frac{1}{2}$	5,808
2	6	"	3	6	31	4,978
3	0	"	3	0	30 $\frac{1}{4}$	4,840
3	0	"	3	6	25 $\frac{1}{2}$	4,082
3	0	"	4	0	22 $\frac{1}{2}$	3,630
3	6	"	3	6	21 $\frac{3}{4}$	3,518
3	6	"	4	0	19 $\frac{1}{2}$	3,111
3	6	"	4	6	17 $\frac{1}{2}$	2,765
4	0	"	4	0	17	2,722
4	0	"	4	6	13	2,420
4	0	"	5	0	13 $\frac{1}{2}$	2,143
4	6	"	4	6	13	2,116
4	6	"	5	0	12	1,936
4	6	"	5	6	11	1,760
5	0	"	5	0	10 $\frac{1}{4}$	1,742
5	0	"	5	6	9 $\frac{3}{4}$	1,584
5	0	"	6	0	9	1,452
5	6	"	5	6	9	1,440
5	6	"	6	0	8 $\frac{1}{4}$	1,320
5	6	"	6	6	7 $\frac{1}{2}$	1,218
6	0	"	6	0	7 $\frac{1}{4}$	1,210
6	0	"	6	6	7	1,158
6	0	"	7	0	6 $\frac{1}{2}$	1,040
6	6	"	6	6	6 $\frac{1}{4}$	1,031
7	0	"	7	0	5 $\frac{1}{2}$	,888
7	6	"	7	6		,774
8	0	"	8	0		,681
8	6	"	8	6		,602
9	0	"	9	0		,537
10	0	"	10	0		,435
12	0	"	12	0		,302
14	0	"	14	0		,221
16	0	"	16	0		,169
16	6	"	16	6		,160 rods.

A Table of Weights and Prices, from 1lb. to 112lbs., at the several prices from 45s. per cwt. to 327s. 6d. per cwt., the tables advancing 2s. 6d. per cwt. The fractional parts are computed at the 7th part of a farthing, the intervening advances of 2s. 6d. have the 14th part of a farthing, denoted by the small figure 2 in the column of 7ths.

Explanation of the Tables.

The decimal number for parts of a farthing for every one shilling advance on 112lb. .. is .4285714 equal to 3-7ths of a farthing.

For two shillings it is	.8571428	=	6-7	..
three shillings ..	1.2857142	=	1 2-7	..
four shillings ..	1.7142856	=	1 5-7	..
five shillings ..	2.1428570	=	2 1-7	..

Examples from the Tables.

A Pocket of Kent Hops will weigh about 1 cwt. 1 qr. 6 lbs. at the

	s.	d.	f.	7th.	
price of £6 7s. 6d. =	127	6	0	0	for 1 cwt.
	31	10	2	0	= 1-4th
	6	9	3	6	= 6lb.
	<hr/>				
	166	2	1	6	
	<hr/>				
					<i>Answer.</i>
	£	s.	d.	f.	7th.
	8	6	2	1	6

A Bag of Sussex Hops will weigh about 2 cwt. 2 qrs. 9 lbs. at the

	s.	d.	f.	7th.	
price of £4 17s. 6d. =	97	6	0	0	} = 2 cwt.
	97	6	0	0	
	48	9	0	0	
	7	10	0	0	= 9lb. <i>Answer.</i>
	<hr/>				
	251	7	0	0	$\frac{1}{14}$
	<hr/>				
					<i>Answer.</i>
	£	s.	d.	f.	7th.
	12	11	7	0	$\frac{1}{14}$

A Bag of Farnham Hops will weigh about 2 cwt. 1 qr. 3 lbs. at the

	s.	d.	f.	7th.	
price of £11 15s. 0d. =	235	0	0	0	} = 2 cwt.
	235	0	0	0	
	58	9	0	0	
	6	3	2	1	= 3lb. <i>Answer.</i>
	<hr/>				
	534	0	2	1	
	<hr/>				
					<i>Answer.</i>
	£	s.	d.	f.	7th.
	26	14	0	$\frac{1}{2}$	$\frac{1}{7}$

A Dairy of Cheese weighing 12 cwt. 3 qrs. 15lb. at 52s. 6d. per cwt.

£ s. d. f. 7th.

2 12 6 0 0

12

31 10 0 0 0

1 19 4 $\frac{1}{2}$ 0

0 7 0 $\frac{1}{4}$ 3 $\frac{2}{14}$

£33 16 4 3 3 $\frac{2}{14}$

Answer.

112lbs. at 45s.					112lbs. at 50s.					112lbs. at 55s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	4	3	2	1	0	5	1	3	1	0	5	3	4
2	0	9	2	4	2	0	10	2	6	2	0	11	3	1
3	1	2	1	6	3	1	4	0	2	3	1	5	2	5
4	1	7	1	1	4	1	9	1	5	4	1	11	2	2
5	2	0	0	3	5	2	2	3	1	5	2	5	1	6
6	2	4	3	5	6	2	8	0	4	6	2	11	1	3
7	2	9	3	0	7	3	1	2	0	7	3	5	1	0
8	3	2	2	2	8	3	6	3	3	8	3	11	0	4
9	3	7	1	4	9	4	0	0	6	9	4	5	0	1
10	4	0	0	6	10	4	5	2	2	10	4	10	3	5
15	6	0	1	2	15	6	8	1	3	15	7	4	1	4
20	8	0	1	5	20	8	11	0	4	20	9	9	3	3
25	10	0	2	1	25	11	1	3	5	25	12	3	1	2
28	11	3	0	0	28	12	6	0	0	28	13	9	0	0
56	22	6	0	0	56	25	0	0	0	56	27	6	0	0
84	33	9	0	0	84	37	6	0	0	84	41	3	0	0

112lbs. at 47s. 6d.					112lbs. at 52s. 6d.					112lbs. at 57s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	5	0	2 ²	1	0	5	2	3 ²	1	0	6	0	4 ²
2	0	10		5	2	0	11	1	0	2	1	0	1	2
3	1	3	1	0 ²	3	1	4	3	3 ²	3	1	6	1	6 ²
4	1	8	1	3	4	1	10	2	0	4	2	0	2	4
5	2	1	1	5 ²	5	2	4	0	3 ²	5	2	6	3	1 ²
6	2	6	2	1	6	2	9	3	0	6	3	0	3	6
7	2	11	2	3 ²	7	3	3	1	3 ²	7	3	7	0	3 ²
8	3	4	2	6	8	3	9	0	0	8	4	1	1	1
9	3	9	3	1 ²	9	4	2	2	3 ²	9	4	7	1	5 ²
10	4	2	3	4	10	4	8	1	0	10	5	1	2	3
15	6	4	1	9 ²	15	7	0	1	3 ²	15	7	8	1	4 ²
20	8	5	3	1	20	9	4	2	0	20	10	3	0	6
25	10	7	0	6 ²	25	11	8	2	3 ²	25	12	10	0	0 ²
28	11	10	2	0	28	13	1	2	0	28	14	4	2	0
56	23	9	0	0	56	26	3	0	0	56	28	9	0	0
84	35	7	2	0	84	39	4	2	0	84	43	1	2	0

112lbs. at 60s.					111lbs. at 65s.					112lbs. at 70s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	6	1	5	1	0	6	3	6	1	0	7	2	0
2	1	0	3	3	2	1	1	3	5	2	1	3	0	0
3	1	7	1	1	3	1	8	3	4	3	1	10	2	0
4	2	1	2	6	4	2	3	3	3	4	2	6	0	0
5	2	8	0	4	5	2	10	3	2	5	3	1	2	0
6	3	2	2	2	6	3	5	3	1	6	3	9	0	0
7	3	9	0	0	7	4	0	3	0	7	4	4	2	0
8	4	3	4	5	8	4	7	2	6	8	5	0	0	0
9	4	9	3	3	9	5	2	2	5	9	5	7	2	0
10	5	4	1	1	10	5	9	2	4	10	6	3	0	0
15	8	0	1	5	15	8	8	1	6	15	9	4	2	0
20	10	8	2	2	20	11	7	1	1	20	12	6	0	0
25	13	4	2	6	25	14	6	0	3	25	15	7	2	0
28	15	0	0	0	28	16	3	0	0	28	17	6	0	0
56	30	0	0	0	56	32	6	0	0	56	35	0	0	0
84	45	0	0	0	84	48	9	0	0	84	52	6	0	0

112lbs. at 62s. 6d.					112lbs. at 67s. 6d.					112lbs. at 72s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	6	2	5 ²	1	0	7	0	6 ²	1	0	7	3	0 ²
2	1	1	1	4	2	1	2	1	6	2	1	3	2	1
3	1	8	0	2 ³	3	1	9	2	5 ²	3	1	11	1	1 ²
4	2	2	3	1	4	2	4	3	5	4	2	7	0	2
5	2	9	1	6 ²	5	3	0	0	4 ²	5	3	2	3	2 ²
6	3	4	0	5	6	3	7	1	4	6	3	10	2	3
7	3	10	3	3 ²	7	4	2	2	3 ²	7	4	6	1	3 ²
8	4	5	2	2	8	4	9	3	3	8	5	2	0	4
9	5	0	1	0 ²	9	5	5	0	2 ²	9	5	9	3	4 ²
10	5	6	3	6	10	6	0	1	2	10	6	5	2	5
15	8	4	1	5 ²	15	9	0	1	6 ²	15	9	8	2	0 ²
20	11	1	3	5	20	12	0	2	4	20	12	11	1	3
25	13	11	1	4	25	15	0	3	1 ²	25	16	2	0	5 ²
28	15	7	2	0	28	16	10	2	0	28	18	1	2	0
56	31	3	0	0	56	33	9	0	0	56	36	3	0	0
84	46	10	2	0	84	50	7	2	0	84	54	4	2	0

112lbs. at 75s.					112lbs. at 80s.					112lbs. at 85s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	8	0	1	1	0	8	2	2	1	0	9	0	3
2	1	4	0	2	2	1	5	0	4	2	1	6	0	6
3	2	0	0	3	3	2	1	2	6	3	2	3	1	2
4	2	8	0	4	4	2	10	1	1	4	3	0	1	5
5	3	4	0	5	5	3	6	3	3	5	3	9	2	1
6	4	0	0	6	6	4	3	1	5	6	4	6	2	4
7	4	8	1	0	7	5	0	0	0	7	5	3	3	0
8	5	4	1	1	8	5	8	2	2	8	6	0	3	3
9	6	0	1	2	9	6	5	0	4	9	6	9	3	6
10	6	8	1	3	10	7	1	2	6	10	7	7	0	2
15	10	0	2	1	15	10	8	2	2	15	11	4	2	3
20	13	4	2	6	20	14	3	1	5	20	15	2	0	4
25	16	8	3	4	25	17	10	1	1	25	18	11	2	5
28	18	9	0	0	28	20	0	0	0	28	21	3	0	0
56	37	6	0	0	56	40	0	0	0	56	42	6	0	0
84	56	3	0	0	84	60	0	0	0	84	63	9	0	0

112lbs. at 77s. 6d.					112lbs. at 82s. 6d.					112lbs. at 87s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	8	1	1 ²	1	0	8	3	2 ²	1	0	9	1	3 ²
2	1	4	2	3	2	1	5	2	5	2	1	6	3	0
3	2	0	3	4 ²	3	2	2	2	0 ²	3	2	4	0	3 ²
4	2	8	4	6	4	2	11	1	3	4	3	1	2	0
5	3	5	2	0 ²	5	3	8	0	5 ²	5	3	10	3	3 ²
6	4	1	3	2	6	4	5	0	1	6	4	8	1	0
7	4	10	0	3 ²	7	5	1	3	3 ²	7	5	5	2	3 ²
8	5	6	1	5	8	5	0	2	6	8	6	3	0	0
9	6	2	2	6 ²	9	6	7	2	1 ²	9	7	0	1	3 ²
10	6	11	0	1	10	7	4	1	4	10	7	9	3	0
15	10	4	2	1 ²	15	11	10	2	2 ²	15	11	8	2	3 ²
20	13	10	0	2	20	14	8	3	1	20	15	7	2	0
25	17	3	2	2 ²	25	18	4	3	6 ²	25	19	6	1	3 ²
28	19	4	2	0	28	20	7	2	0	28	21	10	2	0
56	38	9	0	0	56	41	3	0	0	56	43	9	0	0
84	58	1	2	0	84	61	10	2	0	84	65	7	2	0

112lbs. at 90s.					112lbs. at 95s.					112lbs. at 100s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	5ths.	lbs.	s.	d.	f.	7ths.
1	0	9	2	4	1	0	10	0	5	1	0	10	2	6
2	1	7	1	1	2	1	8	1	3	2	1	9	1	5
3	2	4	3	5	3	2	6	2	1	3	2	8	0	4
4	3	2	2	2	4	3	4	2	6	4	3	6	3	3
5	4	0	0	6	5	4	2	3	4	5	4	5	2	2
6	4	9	3	3	6	5	1	0	2	6	5	4	1	1
7	5	7	2	0	7	5	11	1	0	7	6	3	0	0
8	6	5	0	4	8	6	9	1	5	8	7	1	2	6
9	7	2	3	1	9	7	7	2	3	9	8	0	1	5
10	8	0	1	5	10	8	5	3	1	10	8	11	0	4
15	12	0	2	4	15	12	8	2	5	15	13	4	2	6
20	16	0	3	3	20	16	11	2	2	20	17	10	1	1
25	20	1	0	2	25	21	2	1	6	25	22	3	3	3
28	22	6	0	0	28	23	9	0	0	28	25	0	0	0
56	45	0	0	0	56	47	6	0	0	56	50	0	0	0
84	67	6	0	0	84	71	3	0	0	84	75	0	0	0

112lbs. at 92s. 6d.					112lbs. at 97s. 6d.					112lbs. at 102s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	9	3	4 ²	1	0	10	1	5 ²	1	0	10	3	6 ²
2	1	7	3	2	2	1	8	3	4	2	1	9	3	6
3	2	5	2	6 ²	3	2	7	1	2 ²	3	2	8	3	5 ²
4	3	3	2	4	4	3	5	3	1	4	3	7	3	5
5	4	1	2	1 ²	5	4	4	0	6 ²	5	4	6	3	4 ²
6	4	11	1	6	6	5	2	2	5	6	5	5	3	4
7	5	9	1	3 ²	7	6	1	0	3 ²	7	6	4	3	3 ²
8	6	7	1	1	8	6	11	2	2	8	7	3	3	3
9	7	5	0	5 ²	9	7	10	0	0 ²	9	8	2	3	2 ²
10	8	3	0	3	10	8	8	1	6	10	9	1	3	2
15	12	4	2	4 ²	15	13	0	2	5 ²	15	13	8	2	6 ²
20	16	6	0	6	20	17	4	3	5	20	18	3	2	4
25	20	7	3	0	25	21	9	0	4 ²	25	22	10	2	1 ²
28	23	1	2	0	28	24	4	2	0	28	25	7	2	0
56	46	3	0	0	56	48	9	0	0	56	51	3	0	0
84	69	4	2	0	84	73	1	2	0	84	76	10	2	0

112lbs. at 105s.					112lbs at 110s.					112lbs. at 115s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	11	1	0	1	0	11	3	1	1	1	0	1	2
2	1	10	2	0	2	1	11	2	2	2	2	0	2	4
3	2	9	3	0	3	2	11	1	3	3	3	0	3	6
4	3	9	0	0	4	3	11	0	4	4	4	1	1	1
5	4	8	1	0	5	4	10	3	5	5	5	1	2	3
6	5	7	2	0	6	5	10	2	6	6	6	1	3	5
7	6	6	3	0	7	6	10	2	0	7	7	2	1	0
8	7	6	0	0	8	7	10	1	1	8	8	2	2	2
9	8	5	1	0	9	8	10	0	2	9	9	2	3	4
10	9	4	2	0	10	9	9	3	3	10	10	3	0	6
15	14	0	3	0	15	14	8	3	1	15	15	4	3	2
20	18	9	0	0	20	19	7	2	6	20	20	6	1	5
25	23	5	1	0	25	24	6	2	4	25	25	8	0	1
28	26	3	0	0	28	27	6	0	0	28	28	9	0	0
56	52	6	0	0	56	55	0	0	0	56	57	6	0	0
84	78	9	0	0	84	82	6	0	0	84	86	3	0	0

112lbs.at 107s.6d.					112lbs.at 112s.6d.					112lbs.at 117s.6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	0	11	2	0 ²	1	1	0	0	1 ²	1	1	0	2	2 ²
2	1	11	0	1	2	2	0	0	3	2	2	1	0	5
3	2	10	2	1 ²	3	3	0	0	4 ²	3	3	1	3	0 ²
4	3	10	0	2	4	4	0	0	6	4	4	2	1	3
5	4	9	2	2 ²	5	5	0	1	0 ²	5	5	2	3	5 ²
6	5	9	0	3	6	6	0	1	2	6	6	3	2	1
7	6	8	2	3 ²	7	7	0	1	3 ²	7	7	4	0	3 ²
8	7	8	0	4	8	8	0	1	5	8	8	4	2	6
9	8	7	2	4 ²	9	9	0	1	6 ²	9	9	5	1	1 ²
10	9	7	0	5	10	10	0	2	1	10	10	5	3	4
15	14	4	3	0 ²	15	15	0	3	1 ²	15	15	8	3	2 ²
20	19	2	1	3	20	20	1	0	2	20	20	11	3	1
25	23	11	3	5 ²	25	25	1	1	2 ²	25	26	2	2	6 ²
28	26	10	2	0	28	28	1	2	0	28	29	4	2	0
56	53	9	0	0	56	56	3	0	0	56	58	9	0	0
84	80	7	2	0	84	84	4	2	0	84	88	1	2	0

112lbs. at 120s.					112lbs. at 125s.					112lbs. at 130s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	0	3	3	1	1	1	2	4	1	1	1	3	5
2	2	1	2	6	2	2	2	3	1	2	2	3	3	3
3	3	2	2	2	3	3	3	4	5	3	3	5	3	1
4	4	3	1	5	4	4	5	2	2	4	4	7	2	6
5	5	4	1	1	5	5	6	3	6	5	5	9	2	4
6	6	5	0	4	6	6	8	1	3	6	6	11	2	2
7	7	6	0	0	7	7	9	3	0	7	8	1	2	0
8	8	6	3	3	8	8	11	0	4	8	9	3	1	5
9	9	7	2	6	9	10	0	2	1	9	10	5	1	3
10	10	8	2	2	10	11	1	3	5	10	11	7	1	1
15	16	0	3	3	15	16	8	3	4	15	17	4	3	5
20	21	5	0	4	20	22	3	3	3	20	23	2	2	2
25	26	9	1	5	25	27	10	3	2	25	29	0	0	0
28	30	0	0	0	28	31	3	0	0	28	32	6	0	0
56	60	0	0	0	56	62	6	0	0	56	65	0	0	0
84	90	0	0	0	84	93	9	0	0	84	97	6	0	0

112lbs. at 122s. 6d.					112lbs. at 127s. 6d.					112lbs. at 132s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	1	0	3 ²	1	1	1	2	4 ²	1	1	2	0	5 ²
2	2	2	1	0	2	2	3	1	2	2	2	4	1	4
3	3	3	1	3 ²	3	3	4	3	6 ²	3	3	6	2	2 ²
4	4	4	2	0	4	4	6	2	4	4	4	8	3	1
5	5	5	2	3 ²	5	5	8	1	1 ²	5	5	10	3	6 ²
6	6	6	3	0	6	6	9	3	6	6	7	1	0	5
7	7	7	3	3 ²	7	7	11	2	3 ²	7	8	3	1	3 ²
8	8	9	0	0	8	9	1	1	1	8	9	5	2	2
9	9	10	0	3 ²	9	10	2	3	5 ²	9	10	7	3	0 ²
10	10	11	1	0	10	11	4	2	3	10	11	9	3	6
15	16	4	3	3 ²	15	17	0	3	4 ²	15	17	8	3	5 ²
20	21	10	2	0	20	22	9	0	6	20	23	7	3	5
25	27	4	0	3 ²	25	28	5	2	0 ²	25	29	6	3	4 ²
28	30	7	2	0	28	31	10	2	0	28	33	1	2	0
56	61	3	0	0	56	63	9	0	0	56	66	3	0	0
84	91	10	2	0	84	95	7	2	0	84	99	4	2	0

112lbs. at 135s.					112lbs. at 140s.					112lbs. at 145s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	2	1	6	1	1	3	0	0	1	1	3	2	1
2	2	4	3	5	2	2	6	0	0	2	2	7	0	2
3	3	7	1	4	3	3	9	0	0	3	3	10	2	3
4	4	9	3	3	4	5	0	0	0	4	5	2	0	4
5	6	0	1	2	5	6	3	0	0	5	6	5	2	5
6	7	2	3	1	6	7	6	0	0	6	7	9	0	6
7	8	5	1	0	7	8	9	0	0	7	9	0	3	0
8	9	7	2	6	8	10	0	0	0	8	10	4	1	1
9	10	10	0	5	9	11	3	0	0	9	11	7	3	2
10	12	0	2	4	10	12	6	0	0	10	12	11	1	3
15	18	0	3	6	15	18	9	0	0	15	19	5	0	1
20	24	1	1	1	20	25	0	0	0	20	25	10	2	6
25	30	1	2	3	25	31	3	0	0	25	32	4	1	4
28	33	9	0	0	28	35	0	0	0	28	36	3	0	0
56	67	6	0	0	56	70	0	0	0	56	72	6	0	0
84	101	3	0	0	84	105	0	0	0	84	108	9	0	0

112lbs. at 137s. 6d.					112lbs. at 142s. 6d.					112lbs. at 147s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	2	2	6 ²	1	1	3	1	0 ²	1	1	3	3	1 ²
2	2	5	1	6	2	2	6	2	1	2	2	7	2	3
3	3	8	0	5 ²	3	3	9	3	1 ²	3	3	11	1	4 ²
4	4	10	3	5	4	5	1	0	2	4	5	3	0	6
5	6	1	2	4 ²	5	6	4	1	2 ²	5	6	7	0	0 ²
6	7	4	1	4	6	7	7	2	3	6	7	10	3	2
7	8	7	0	3 ²	7	8	10	3	3 ²	7	9	2	2	3 ²
8	9	9	3	3	8	10	2	0	4	8	10	6	1	5
9	11	0	2	2 ²	9	11	5	1	4 ²	9	11	10	0	6 ²
10	12	3	1	2	10	12	8	2	5	10	13	2	0	1
15	18	4	3	6 ²	15	19	1	0	0 ²	15	19	9	0	1 ²
20	24	6	2	4	20	25	5	1	3	20	26	4	0	2
25	30	8	1	1 ²	25	31	9	2	5 ²	25	32	11	0	2 ²
28	34	4	2	0	28	35	7	2	0	28	36	10	2	0
56	68	9	0	0	56	71	3	0	0	56	73	9	0	0
84	103	1	2	0	84	106	10	2	0	84	110	7	2	0

112lbs. at 150s.					112lbs. at 55s.					112lbs. at 160s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	4	0	2	1	1	4	2	3	1	1	5	0	4
2	2	8	0	4	2	2	9	0	6	2	2	10	1	1
3	4	0	0	6	3	4	1	3	2	3	4	3	1	5
4	5	4	1	1	4	5	6	1	5	4	5	8	2	2
5	6	8	1	3	5	6	11	0	1	5	7	1	2	6
6	8	0	1	5	6	8	3	2	4	6	8	6	3	3
7	9	4	2	0	7	9	8	1	0	7	10	0	0	0
8	10	8	2	2	8	11	0	3	3	8	11	5	0	4
9	12	0	2	4	9	12	5	1	6	9	12	10	1	1
10	13	4	2	6	10	13	10	0	2	10	14	3	1	5
15	20	1	0	2	15	20	9	0	3	15	21	5	0	4
20	26	9	1	5	20	27	8	0	4	20	28	6	3	3
25	33	5	3	1	25	34	7	0	5	25	35	8	2	2
28	37	6	0	0	28	38	9	0	0	28	40	0	0	0
56	75	0	0	0	56	77	6	0	0	56	80	0	0	0
84	112	6	0	0	84	116	3	0	0	84	120	0	0	0

112lbs. at 152s. 6d.					112lbs. at 157s. 6d.					112lbs. at 162s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	4	1	2 ²	1	1	4	3	3 ²	1	1	5	1	4 ²
2	2	8	2	5	2	2	9	3	0	2	2	10	3	2
3	4	1	0	0 ²	3	4	2	2	3 ²	3	4	3	4	6 ²
4	5	5	1	3	4	5	7	2	0	4	5	9	2	4
5	6	9	2	5 ²	5	7	0	1	3 ²	5	7	3	0	1 ²
6	8	2	0	1	6	8	5	1	0	6	8	8	1	6
7	9	6	1	3 ²	7	9	10	0	3 ²	7	10	1	3	3 ²
8	10	10	2	6	8	11	3	0	0	8	11	7	1	1
9	12	3	0	1 ²	9	12	7	3	3 ²	9	13	0	2	5 ²
10	13	7	1	4	10	14	0	3	0	10	14	6	0	3
15	20	5	0	2 ²	15	21	1	0	3 ²	15	21	9	0	4 ²
20	27	2	3	1	20	28	1	2	0	20	29	0	0	6
25	34	0	1	6 ²	25	35	1	3	3 ²	25	36	3	1	0 ²
28	38	1	2	0	28	39	4	2	0	28	40	7	2	0
56	76	3	0	0	56	78	9	0	0	56	81	3	0	0
84	114	4	2	0	84	118	1	2	0	84	121	10	2	0

112lbs. at 165s.					112lbs. at 170s.					112lbs. at 175s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	5	2	5	1	1	6	0	6	1	1	6	3	0
2	2	11	1	3	2	3	0	1	5	2	3	1	2	0
3	4	5	0	1	3	4	6	2	4	3	4	8	1	0
4	5	10	2	6	4	6	0	3	3	4	6	3	0	0
5	7	4	1	4	5	7	7	0	2	5	7	9	3	0
6	18	10	0	2	6	9	1	1	1	6	9	4	2	0
7	0	3	3	0	7	10	7	2	0	7	10	11	1	0
8	11	9	1	5	8	12	1	2	6	8	12	6	0	0
9	13	3	0	3	9	13	7	3	5	9	14	0	3	0
10	14	8	3	1	10	15	2	0	4	10	15	7	2	0
15	22	1	0	5	15	22	9	0	6	15	23	5	1	0
20	29	5	2	2	20	30	4	1	1	20	31	3	0	0
25	36	9	3	6	25	37	11	1	3	25	39	0	3	0
28	41	3	0	0	28	42	6	0	0	28	43	9	0	0
56	82	6	0	0	56	85	0	0	0	56	87	6	0	0
84	123	9	0	0	84	127	6	0	0	84	131	3	0	0

112lbs. at 167s. 6d.					112lbs. at 172s. 6d.					112lbs. at 177s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	5	3	5 ²	1	1	6	1	6 ²	1	1	7	0	0 ²
2	2	11	3	4	2	3	0	3	6	2	3	2	0	1
3	4	5	3	2 ²	3	4	7	1	5 ²	3	4	9	0	1 ²
4	5	11	3	1	4	6	1	3	5	4	6	4	0	2
5	7	5	2	6 ²	5	7	8	1	4 ³	5	7	11	0	2 ²
6	8	11	2	5	6	9	2	3	4	6	9	6	0	3
7	10	5	2	3 ²	7	10	9	1	3 ²	7	11	1	0	3 ²
8	11	11	2	2	8	12	3	3	3	8	12	8	0	4
9	13	5	2	0 ²	9	13	10	1	2 ²	9	14	3	0	4 ²
10	14	11	1	6	10	15	4	3	2	10	15	10	0	5
15	22	5	0	5 ²	15	23	1	0	6 ²	15	23	9	1	0 ²
25	29	10	3	5	20	30	9	2	4	20	31	8	1	3
20	37	4	2	4 ²	25	38	6	0	1 ²	25	39	7	1	5 ²
28	41	10	2	0	28	43	1	2	0	28	44	4	2	0
56	83	9	0	0	56	86	3	0	0	56	88	9	0	0
84	125	7	2	0	84	129	4	2	0	84	133	1	2	0

112lbs. at 180s.					112lbs. at 185s.					112lbs. at 190s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	7	1	1	1	1	7	3	2	1	1	8	1	3
2	3	2	2	2	2	3	3	2	4	2	3	4	2	6
3	4	9	3	3	3	4	11	1	6	3	5	1	0	2
4	6	5	0	4	4	6	7	1	1	4	6	9	1	5
5	8	0	1	5	5	8	3	0	3	5	8	5	3	1
6	9	7	2	6	6	9	10	3	5	6	10	2	0	4
7	11	3	0	0	7	11	6	3	0	7	11	10	2	0
8	12	10	1	1	8	13	2	2	2	8	13	6	3	3
9	14	5	2	2	9	14	10	1	4	9	15	3	0	6
10	16	0	3	3	10	16	6	0	6	10	16	11	2	2
15	24	1	1	1	15	24	9	1	2	15	25	5	3	3
20	32	1	2	6	20	33	0	1	5	20	33	11	0	4
25	40	2	0	4	25	41	3	2	1	25	42	4	3	5
28	45	0	0	0	28	46	3	0	0	28	47	6	0	0
56	90	0	0	0	56	92	6	0	0	56	95	0	0	0
84	135	0	0	0	84	138	9	0	0	84	142	6	0	0

112lbs. at 182s. 6d.					112lbs. at 187s. 6d.					112lbs. at 192s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	7	2	1 ²	1	1	8	0	2 ²	1	1	8	2	3 ²
2	3	3	0	3	2	3	4	0	5	2	3	5	1	0
3	4	10	2	4 ²	3	5	0	1	0 ²	3	5	1	3	3 ²
4	6	6	0	6	4	6	8	1	3	4	6	10	2	0
5	8	1	3	0 ³	5	8	4	1	5 ²	5	8	7	0	3 ²
6	9	9	1	2	6	10	0	2	1	6	10	3	3	0
7	11	4	3	3 ²	7	11	8	2	3 ²	7	12	0	1	3 ²
8	13	0	1	5	8	13	4	2	6	8	13	9	0	0
9	14	7	3	6 ²	9	15	0	3	1 ²	9	15	5	2	3 ²
10	16	3	2	1	10	16	8	3	4	10	17	2	1	0
15	24	5	1	1 ²	15	25	1	1	2 ²	15	25	9	1	3 ²
20	32	7	0	2	20	33	5	3	1	20	34	4	2	0
25	40	8	3	2 ²	25	41	10	0	6 ²	25	42	11	2	3 ²
28	45	7	2	0	28	46	10	2	0	28	48	1	2	0
56	91	3	0	0	56	93	9	0	0	56	96	3	0	0
84	61	10	2	0	84	140	7	2	0	84	144	4	2	0

112lbs. at 195s.					112lbs. at 200s.					112lbs. at 205s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	8	3	4	1	1	9	1	5	1	1	9	3	6
2	3	5	3	1	2	3	6	3	3	2	3	7	3	5
3	5	2	2	5	3	5	4	1	1	3	5	5	3	4
4	6	11	2	2	4	7	1	2	6	4	7	3	3	3
5	8	8	1	6	5	8	11	0	4	5	9	1	3	2
6	10	5	1	3	6	10	8	2	2	6	10	11	3	1
7	12	2	1	0	7	12	6	0	0	7	12	9	3	0
8	13	11	0	4	8	14	3	1	5	8	14	7	2	6
9	15	8	0	1	9	16	0	3	3	9	16	5	2	5
10	17	4	3	5	10	17	10	1	1	10	18	3	2	4
15	26	1	1	4	15	26	9	1	5	15	27	5	1	6
30	34	9	3	3	20	35	8	2	2	20	36	7	1	1
25	43	6	1	2	25	44	7	2	6	25	45	9	0	3
28	48	9	0	0	28	50	0	0	0	28	51	3	0	0
56	97	6	0	0	56	100	0	0	0	56	102	6	0	0
84	146	3	0	0	84	150	0	0	0	84	153	9	0	0

112lbs. at 197s. 6d.					112lbs. at 202s. 6d.					112lbs. at 207s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	9	0	4 ²	1	1	9	2	5 ²	1	1	10	0	6 ²
2	3	6	1	2	2	3	7	1	4	2	3	8	1	6
3	5	3	1	6 ²	3	5	5	0	2 ²	3	5	6	2	5 ²
4	7	0	2	4	4	7	2	3	1	4	7	4	3	5
5	8	9	3	1 ²	5	9	0	1	6 ²	5	9	3	0	4 ²
6	10	6	3	6	6	10	10	0	5	6	11	1	1	4
7	12	4	0	3 ²	7	12	7	3	3 ²	7	12	11	2	3 ²
8	14	1	1	1	8	14	5	2	2	8	14	9	3	3
9	15	10	1	5 ²	9	16	3	1	0 ²	9	16	8	0	2 ²
10	17	7	2	3	10	18	0	3	6	10	18	6	1	2
15	26	5	1	4 ²	15	27	1	1	5 ²	15	27	9	1	6 ²
20	35	3	0	6	20	36	1	3	5	20	37	0	2	4
25	44	1	0	0 ²	25	45	2	1	4 ²	25	46	3	3	1 ²
28	49	4	2	0	28	50	7	2	0	28	51	10	2	0
56	98	9	0	0	56	101	3	0	0	56	103	9	0	0
84	148	1	2	0	84	151	10	2	0	84	155	7	2	0

112lbs. at 210s.					112lbs. at 215s.					112lbs. at 220s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	10	2	0	1	1	11	0	1	1	1	11	2	2
2	3	9	0	0	2	3	10	0	2	2	3	11	0	4
3	5	7	2	0	3	5	9	0	3	3	5	10	2	6
4	7	6	0	0	4	7	8	0	4	4	7	10	1	1
5	9	4	2	0	5	9	7	0	5	5	9	9	3	3
6	11	3	0	0	6	11	6	0	6	6	11	9	1	5
7	13	1	2	0	7	13	5	1	0	7	13	9	0	0
8	15	0	0	0	8	15	4	1	1	8	15	8	2	2
9	16	10	2	0	9	17	3	1	2	9	17	8	0	4
10	18	9	0	0	10	19	2	1	3	10	19	7	2	6
15	28	1	2	0	15	28	9	2	1	15	29	5	2	2
20	37	6	0	0	20	38	4	2	6	20	39	3	1	5
25	46	10	2	0	25	47	11	3	4	25	49	1	1	1
28	52	6	0	0	28	53	9	0	0	28	55	0	0	0
56	105	0	0	0	56	107	6	0	0	56	110	0	0	0
84	157	6	0	0	84	161	3	0	0	84	165	0	0	0

112lbs. at 212s. 6d.					112lbs. at 217s. 6d.					112lbs. at 222s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	1	10	3	0 ²	1	1	11	1	1 ²	1	1	11	3	2 ²
2	3	9	2	1	2	3	10	2	3	2	3	11	2	5
3	5	8	1	1 ²	3	5	9	3	4 ²	3	5	11	2	0 ²
4	7	7	0	2	4	7	9	0	6	4	7	11	1	3
5	9	5	3	2 ²	5	9	8	2	0 ²	5	9	11	0	5 ²
6	11	4	2	3	6	11	7	3	2	6	11	11	0	1
7	13	3	1	3 ²	7	13	7	0	3 ²	7	13	10	3	3 ²
8	15	2	0	4	8	15	6	1	5	8	15	10	2	6
9	17	0	3	4 ²	9	17	5	2	6 ²	9	17	10	2	1 ²
10	18	11	2	5	10	19	5	0	1	10	19	10	1	4
15	28	5	2	0 ²	15	29	1	2	1 ²	15	29	9	2	2 ²
20	37	11	1	3	20	38	10	0	2	20	39	8	3	1
25	47	5	0	5 ²	25	48	6	2	2 ²	25	49	7	3	6 ²
28	53	1	2	0	28	54	4	2	0	28	55	7	2	0
56	106	3	0	0	56	108	9	0	0	56	111	3	0	0
84	159	4	2	0	84	163	1	2	0	84	166	10	2	0

112lbs. at 225s.					112lbs at 230s.					112lbs. at 235s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	0	0	3	1	2	0	2	4	1	2	1	0	5
2	4	0	0	6	2	4	1	1	1	2	4	2	1	3
3	6	0	1	2	3	6	1	3	5	3	6	3	2	1
4	8	0	1	5	4	8	2	2	2	4	8	4	2	6
5	10	0	2	1	5	10	3	0	6	5	10	5	3	4
6	12	0	2	4	6	12	3	3	3	6	12	7	0	2
7	14	0	3	0	7	14	4	2	0	7	14	8	1	0
8	16	0	3	3	8	16	5	0	4	8	16	9	1	5
9	18	0	3	6	9	18	5	3	1	9	18	10	2	3
10	20	1	0	2	10	20	6	1	5	10	20	11	3	1
15	30	1	2	3	15	30	9	2	4	15	31	5	2	5
20	40	2	0	4	20	41	0	3	3	20	41	11	2	2
25	50	2	2	5	25	51	4	0	2	25	52	5	1	6
28	56	3	0	0	28	57	6	0	0	28	58	9	0	0
56	112	6	0	0	56	115	0	0	0	56	117	6	0	0
84	168	9	0	0	84	172	6	0	0	84	176	3	0	0

112lbs.at 227s.6d.					112lbs.at 232s.6d.					112lbs.at 237s.6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	0	1	3 ²	1	2	0	3	4 ²	1	2	1	1	5 ²
2	4	0	3	0	2	4	1	3	2	2	4	2	3	4
3	6	1	0	3 ²	3	6	2	2	6 ²	3	6	4	1	2 ²
4	8	1	2	0	4	8	3	2	4	4	8	5	3	1
5	10	1	3	3 ²	5	10	4	2	1 ²	5	10	7	0	6 ²
6	12	2	1	0	6	12	5	1	6	6	12	8	2	5
7	14	2	2	3 ²	7	14	6	1	3 ²	7	14	10	0	3 ²
8	16	3	0	0	8	16	7	1	1	8	16	11	2	2
9	18	3	1	3 ²	9	18	8	0	5 ²	9	19	1	0	0 ²
10	20	3	3	0	10	20	9	0	3	10	21	2	1	6
15	30	5	2	3 ²	15	31	1	2	4 ²	15	31	9	2	5 ²
20	40	7	2	0	20	41	6	0	6	20	42	4	3	5
25	50	9	1	3 ²	25	51	10	3	0 ²	25	53	0	0	4 ²
28	56	10	2	0	28	58	1	2	0	28	59	4	2	0
56	113	9	0	0	56	116	3	0	0	56	118	9	0	0
84	170	7	2	0	84	174	4	2	0	84	178	1	2	0

112lbs. at 240s.					112lbs. at 245s.					112lbs. at 250s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	1	2	6	1	2	2	1	0	1	2	2	3	1
2	4	3	1	5	2	4	4	2	0	2	4	5	2	2
3	6	5	0	4	3	6	6	3	0	3	6	8	1	3
4	8	6	3	3	4	8	9	0	0	4	8	11	0	4
5	10	8	2	2	5	10	11	1	0	5	11	1	3	5
6	12	10	1	1	6	13	1	2	0	6	13	4	2	6
7	15	0	0	0	7	15	3	3	0	7	15	7	2	0
8	17	1	2	6	8	17	6	0	0	8	17	10	1	1
9	19	3	1	5	9	19	8	1	0	9	20	1	0	2
10	21	5	0	4	10	21	10	2	0	10	22	3	3	3
15	32	1	2	6	15	32	9	3	0	15	33	5	3	1
20	42	10	1	1	20	43	9	0	0	20	44	7	2	6
25	53	6	3	3	25	54	8	1	0	25	55	9	2	4
28	60	0	0	0	28	61	3	0	0	28	62	6	0	0
56	120	0	0	0	56	122	6	0	0	56	125	0	0	0
84	180	0	0	0	84	183	9	0	0	84	187	6	0	0

112lbs. at 242s. 6d.					112lbs. at 247s. 6d.					112lbs. at 252s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	1	3	6 ²	1	2	2	2	0 ²	1	2	3	0	1 ²
2	4	3	3	6	2	4	5	0	1	2	4	6	0	3
3	6	5	3	5 ²	3	6	7	2	1 ²	3	6	9	0	4 ²
4	8	7	3	5	4	8	10	0	2	4	9	0	0	6
5	10	9	3	4 ²	5	11	0	2	2 ²	5	11	3	1	0 ²
6	12	11	3	4	6	13	3	0	3	6	13	6	1	2
7	15	1	3	3 ²	7	15	5	2	3 ²	7	15	9	1	3 ²
8	17	3	3	3	8	17	8	0	4	8	18	0	1	5
9	19	5	3	2 ²	9	19	10	2	4 ²	9	20	3	1	6 ²
10	21	7	3	2	10	22	1	0	5	10	22	6	2	1
15	32	5	2	6 ²	15	33	1	3	0 ²	15	33	9	3	1 ²
20	43	3	2	4	20	44	2	1	3	20	45	1	0	2
25	54	1	2	1 ²	25	55	2	3	5 ²	25	56	4	1	2 ²
28	60	7	2	0	28	61	10	2	0	28	63	1	2	0
56	121	3	0	0	56	123	9	0	0	56	126	3	0	0
81	181	10	2	0	84	185	7	2	0	84	189	4	2	0

112lbs. at 255s.					112lbs. at 260s.					112lbs. at 265s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	3	1	2	1	2	3	3	3	1	2	4	1	4
2	4	6	2	4	2	4	7	2	6	2	4	8	3	1
3	6	9	3	6	3	6	11	2	2	3	7	1	0	5
4	9	1	1	1	4	9	3	1	5	4	9	5	2	2
5	11	4	2	3	5	11	7	1	1	5	11	9	3	6
6	13	7	3	5	6	13	11	0	4	6	14	2	1	3
7	15	11	1	0	7	16	3	0	0	7	16	6	3	0
8	18	2	2	2	8	18	6	3	3	8	18	11	0	4
9	20	5	3	4	9	20	10	2	6	9	21	3	2	1
10	22	9	0	6	10	23	2	2	2	10	23	7	3	5
15	34	1	3	2	15	34	9	3	3	15	35	5	3	4
20	45	6	1	5	20	46	5	0	4	20	47	3	3	3
25	56	11	0	1	25	58	0	1	5	25	59	1	3	2
28	63	9	0	0	28	65	0	0	0	28	66	3	0	0
56	127	6	0	0	56	130	0	0	0	56	132	6	0	0
84	191	3	0	0	84	195	0	0	0	84	198	9	0	0

112lbs. at 257s. 6d.					112lbs. at 262s. 6d.					112lbs. at 267s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	3	2	2 ²	1	2	4	0	3 ²	1	2	4	2	4 ²
2	4	7	0	5	2	4	8	1	0	2	4	6	1	2
3	6	10	3	0 ²	3	7	0	1	3 ²	3	7	1	3	6 ²
4	9	2	1	3	4	9	4	2	0	4	9	6	2	4
5	11	5	3	5 ²	5	11	8	2	3 ²	5	11	11	1	1 ²
6	13	9	2	1	6	14	0	3	0	6	14	3	3	6
7	16	1	0	3 ²	7	16	4	3	3 ²	7	16	8	2	3 ²
8	18	4	2	6	8	18	9	0	0	8	19	1	1	1
9	20	8	1	1 ²	9	21	1	0	3 ²	9	21	5	3	5 ²
10	22	11	3	4	10	23	5	1	0	10	23	10	2	3
15	34	5	3	2 ²	15	35	1	3	3 ²	15	35	9	3	4 ²
20	45	11	3	1	20	46	10	2	0	20	47	9	0	6
25	57	5	2	6 ²	25	58	7	0	3 ²	25	59	8	2	0 ⁰
28	64	4	2	0	28	65	7	2	0	28	66	10	2	0
56	128	9	0	0	56	131	3	0	0	56	133	9	0	0
84	193	1	2	0	84	196	10	2	0	84	200	7	2	0

112lbs. at 270s.					112lbs. at 275s.					112lbs. at 280s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	4	3	5	1	2	5	1	6	1	2	6	0	0
2	4	9	3	3	2	4	10	3	5	2	5	0	0	0
3	7	2	3	1	3	7	4	1	4	3	7	6	0	0
4	9	7	2	6	4	9	9	3	3	4	10	0	0	0
5	12	0	2	4	5	12	3	1	2	5	12	6	0	0
6	14	5	2	2	6	14	8	3	1	6	15	0	0	0
7	16	10	2	0	7	17	2	1	0	7	17	6	0	0
8	19	3	1	5	8	19	7	2	6	8	20	0	0	0
9	21	8	1	3	9	22	1	0	5	9	22	6	0	0
10	24	1	1	1	10	24	6	2	4	10	25	0	0	0
15	36	1	3	5	15	36	9	3	6	15	37	6	0	0
20	48	2	2	2	20	49	1	1	1	20	50	0	0	0
25	60	3	0	6	25	61	4	2	3	25	62	6	0	0
28	67	6	0	0	28	68	9	0	0	28	70	0	0	0
56	135	0	0	0	56	137	6	0	0	56	140	0	0	0
84	202	6	0	0	84	206	3	0	0	84	210	0	0	0

112lbs. at 272s. 6d.					112lbs. at 277s. 6d.					112lbs. at 282s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	5	0	5 ²	1	2	5	2	6 ²	1	2	6	1	0 ²
2	4	10	1	4	2	2	11	1	6	2	5	0	2	1
3	7	3	2	2 ²	3	5	5	0	5 ²	3	7	6	3	1 ²
4	9	8	3	1	4	7	10	3	5	4	10	1	0	2
5	12	1	3	6 ²	5	10	4	2	4 ²	5	12	7	1	2 ²
6	14	7	0	5	6	12	10	1	4	6	15	1	2	3
7	17	0	1	3 ²	7	15	4	0	3 ²	7	17	7	3	3 ²
8	19	5	2	2	8	17	9	3	3	8	20	2	0	4
9	21	10	3	0	9	20	3	2	2 ²	9	22	8	1	4 ²
10	24	3	3	6	10	22	9	1	2	10	25	2	2	5
15	36	5	3	5 ²	15	33	1	3	6 ²	15	37	10	0	0 ²
20	48	7	3	5	20	43	6	2	4	20	50	5	1	3
25	60	9	3	4 ²	25	53	11	1	1 ²	25	63	0	2	5 ²
28	68	1	2	0	28	69	4	2	0	28	70	7	2	0
56	136	3	0	0	56	138	9	0	0	56	141	3	0	0
84	204	4	2	0	84	208	1	2	0	84	211	10	2	0

112lbs. at 285s.					112lbs. at 290s.					112lbs. at 295s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	5ths.	lbs.	s.	d.	f.	7ths.
1	2	6	2	1	1	2	7	0	2	1	2	7	2	3
2	5	1	0	2	2	5	2	0	4	2	5	3	0	6
3	7	7	2	3	3	7	9	0	6	3	7	10	3	2
4	10	2	0	4	4	10	4	1	1	4	10	6	1	5
5	12	8	2	5	5	12	11	1	3	5	13	2	0	1
6	15	3	0	6	6	15	6	1	5	6	15	9	2	4
7	17	9	3	0	7	18	1	2	0	7	18	5	1	0
8	20	4	1	1	8	20	8	2	2	8	21	0	3	3
9	22	10	3	2	9	23	3	2	4	9	23	8	1	6
10	25	5	1	3	10	25	10	2	6	10	26	4	0	2
15	38	2	0	1	15	38	10	0	2	15	39	6	0	3
20	50	10	2	6	20	51	9	1	5	20	52	8	0	4
25	63	7	1	4	25	64	8	3	1	25	65	10	0	5
28	71	3	0	0	28	72	6	0	0	28	73	9	0	0
56	142	6	0	0	56	145	0	0	0	56	147	6	0	0
84	213	9	0	0	84	217	6	0	0	84	221	3	0	0

112lbs.at287s.6d.					112lbs.at292s.6d.					112lbs.at297s.6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	6	3	1 ²	1	2	7	1	2 ²	1	2	7	3	3 ²
2	5	1	2	3	2	5	2	2	5	2	5	3	3	0
3	7	8	1	4 ²	3	7	10	0	0 ²	3	7	11	2	3 ²
4	10	3	0	6	4	10	5	1	3	4	10	7	2	0
5	12	10	0	0 ²	5	12	0	2	5 ²	5	13	3	1	3 ²
6	15	4	3	2	6	15	8	0	1	6	15	11	1	0
7	17	11	2	3 ²	7	18	3	1	3 ²	7	18	7	0	3 ²
8	20	6	1	5	8	20	10	2	6	8	21	3	0	0
9	23	1	0	6 ²	9	23	6	0	1 ²	9	23	10	3	3 ²
10	25	8	0	1 ²	10	26	1	1	4	10	26	6	3	0
15	38	6	0	1 ²	15	39	2	0	2 ²	15	39	10	0	3 ²
20	51	4	0	2	20	52	2	3	1	20	53	1	2	0
25	64	2	0	2 ²	25	65	3	1	6 ²	25	66	4	3	5 ²
28	71	10	2	0	28	73	1	2	0	28	74	4	2	0
56	143	9	0	0	56	146	3	0	0	56	149	9	0	0
84	215	7	2	0	84	219	4	2	0	84	223	1	2	0

112lbs. at 300s.					112lbs. at 305s.					112lbs. at 310s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	8	0	4	1	2	8	2	5	1	2	9	0	6
2	5	4	1	1	2	5	5	1	3	2	5	6	1	5
3	8	0	1	5	3	8	2	0	1	3	8	3	2	4
4	10	8	2	2	4	10	10	2	6	4	11	0	3	3
5	13	4	2	6	5	13	7	1	4	5	13	10	0	2
6	16	0	3	3	6	16	4	0	2	6	16	7	1	1
7	18	9	0	0	7	19	0	3	0	7	19	4	2	0
8	21	5	0	4	8	21	9	1	5	8	22	1	2	6
9	24	1	1	1	9	24	6	0	3	9	24	10	3	5
10	26	9	1	5	10	27	2	3	1	10	27	8	0	4
15	40	2	0	4	15	40	10	0	5	15	41	6	0	6
20	53	6	3	3	20	54	5	2	2	20	55	4	1	1
25	66	11	2	2	25	68	0	3	6	25	69	2	1	3
28	75	0	0	0	28	76	3	0	0	28	77	6	0	0
56	150	0	0	0	56	152	6	0	0	56	155	0	0	0
84	225	0	0	0	84	228	9	0	0	84	232	6	0	0

112lbs. at 302s. 6d.					112lbs. at 307s. 6d.					112lbs. at 312s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	8	1	4 ²	1	2	8	3	5 ²	1	2	9	1	6 ²
2	5	4	3	2	2	5	5	3	4	2	5	6	3	6
3	8	1	0	6 ²	3	8	2	3	2 ²	3	8	4	1	5 ²
4	10	9	2	4	4	10	11	3	1	4	11	1	3	5
5	13	6	0	1 ²	5	13	6	2	6 ²	5	13	11	1	4 ²
6	16	2	1	6	6	16	5	2	5	6	16	8	3	4
7	18	10	3	3 ²	7	19	2	2	3 ²	7	19	6	1	3 ²
8	21	7	1	1	8	21	11	2	2	8	22	3	3	3
9	24	3	2	5 ²	9	24	8	2	0 ²	9	25	1	1	2 ²
10	27	0	0	3	10	27	5	1	6	10	27	10	3	2
15	40	6	0	4 ²	15	41	2	0	5 ²	15	41	10	0	6 ²
20	54	0	0	6	20	54	10	3	5	20	55	9	2	4
25	67	6	1	0 ²	25	68	7	2	4 ²	25	69	9	0	1 ²
28	75	7	2	0	28	76	10	2	0	28	78	1	2	0
56	151	3	0	0	56	153	9	0	0	56	156	3	0	0
84	226	10	2	0	84	230	7	2	0	84	234	4	2	0

112lbs. at 315s.					112lbs. at 320s.					112lbs. at 325s.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	9	3	0	1	2	10	1	1	1	2	10	3	2
2	5	7	2	0	2	5	8	2	2	2	5	9	2	4
3	8	5	1	0	3	8	6	3	3	3	8	8	1	6
4	11	3	0	0	4	11	5	0	4	4	11	7	1	1
5	14	0	3	0	5	14	3	1	5	5	14	6	0	3
6	16	10	2	0	6	17	1	2	6	6	17	4	3	5
7	19	8	1	0	7	20	0	0	0	7	20	3	3	0
8	22	6	0	0	8	22	10	1	1	8	23	2	2	2
9	25	3	3	0	9	25	8	2	2	9	26	1	1	4
10	28	1	2	0	10	28	6	3	3	10	29	0	0	6
15	42	2	1	0	15	42	10	1	1	15	43	6	1	2
20	56	3	0	0	20	57	1	2	6	20	58	0	1	5
25	70	3	3	0	25	71	5	0	4	25	72	6	2	1
28	78	9	0	0	28	80	0	0	0	28	81	3	0	0
56	157	6	0	0	56	160	0	0	0	56	162	6	0	0
84	236	3	0	0	84	240	0	0	0	84	243	9	0	0

112lbs. at 317s. 6d.					112lbs. at 322s. 6d.					112lbs. at 327s. 6d.				
lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.	lbs.	s.	d.	f.	7ths.
1	2	10	0	0 ²	1	2	10	2	1 ²	1	2	11	0	2 ²
2	5	8	0	1	2	5	9	0	3	2	5	10	0	5
3	8	6	0	1 ²	3	8	7	2	4 ²	3	8	9	1	0 ²
4	11	4	0	2	4	11	6	0	6	4	11	8	1	3
5	14	2	0	2 ²	5	14	4	3	0 ²	5	14	7	1	5 ²
6	17	0	0	3	6	17	3	1	2	6	17	6	2	1
7	19	10	0	3 ²	7	20	1	3	3 ²	7	20	5	2	3 ²
8	22	8	0	4	8	23	0	1	5	8	23	4	2	6
9	25	6	0	4 ²	9	25	10	3	6 ²	9	26	3	3	1 ²
10	18	4	0	5	10	28	9	2	1	10	29	2	3	4
15	32	6	1	0 ²	15	43	2	1	1 ²	15	43	10	1	2 ²
20	46	8	1	3	20	57	7	0	2	20	58	5	3	1
25	60	10	1	5 ²	25	71	11	3	2 ²	25	73	1	0	6 ²
28	79	4	2	0	28	80	7	2	0	28	80	10	2	0
56	158	9	0	0	56	161	3	0	0	56	163	9	0	0
84	238	1	2	0	84	241	10	2	0	84	245	7	2	0

An Account of the Total Number of Acres of Land in Great Britain, under the Cultivation of Hops, in the Year 1835; distinguishing the Number of Acres in each Parish.

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
BAUNSTAPLE.		CANTERBURY—	
Landercross	1	<i>continued.</i>	
Littleham	4	Biddenden	196
Milton Damerel... ..	0 $\frac{1}{4}$	Bilsington	32
Monkleigh	1 $\frac{3}{4}$	Baddlesmere	16
Ware Gifford	0 $\frac{3}{4}$	Bishopshourn	65 $\frac{1}{2}$
		Blean	39
TOTAL	7 $\frac{3}{4}$	Bodian	123
BATH.		Boughton Alluph.:	35 $\frac{1}{4}$
Marshfield	2 $\frac{3}{4}$	Ditto under Blean	249
		Brabourne	66
BEDFORD.		Brenchley	52
Fluchingfield	9	Bridge	55
Grest Saling	6	Brook	15 $\frac{1}{2}$
Stambourne	5	Challock	7 $\frac{1}{2}$
Shefford - cum - } Campton	6	Charing	43 $\frac{1}{4}$
		Chart, Little	44 $\frac{1}{4}$
TOTAL	26	Ditto, Great	45 $\frac{1}{2}$
BRISTOL.		Chartham	121 $\frac{1}{2}$
St. Cuthbert Wells	4	Cheriton	5 $\frac{1}{2}$
		Chilham	69
CAMBRIDGE.		Chislett	20 $\frac{1}{2}$
Little Bardfield	4	Cranbrook	819
		Crundale	55 $\frac{1}{2}$
CANTERBURY.		Coldred	2
Acrise	6	Denton	14 $\frac{1}{2}$
Addisham	32	Eastry	19
Aldington	58	Eastwell	14 $\frac{1}{2}$
Alkham	20 $\frac{1}{4}$	Ebony	20
Appledore	11 $\frac{1}{4}$	Edgarton	139
Ash	118	Elham	51 $\frac{3}{4}$
Ashford	5	Elmsted	53 $\frac{1}{4}$
Barham	28	Elmstone	7
Beakshourne	86	Ewell	23
Benenden	584	Faversham	12 $\frac{3}{4}$
Bethersden	109	Fordwich	17 $\frac{1}{2}$
		Folkstone	7 $\frac{1}{2}$
		Frittenden	192
		Godmersham	30

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
CANTERBURY— <i>continued.</i>		CANTERBURY— <i>continued.</i>	
Goodnestone	21	Pluckley	84
Goudhurst	292	Postling	5
Halden	89	Preston	9
Harbledown	103½	Rolvendon	370
Hardress, Great ...	2	Rucking	1
Ditto Upper...	124	Salehurst	47
Ditto Lower ..	94	Sandhurst	66
Haslingleigh	30½	Sarre	1½
Hawkhurst	529	Sevington	18
Hawkinge	0½	Selling	124½
Headcorn	19	Shelwick	2
Herne	41	Shadoxburst	4
Herne Hill	63½	Sibert Would	5
Hinkshill	9¼	Smarden	102
Hoath	40	Smeith	80
Horsmonden	319	Snargate	2
Hothfield	17½	Stanford	10
Hurst	9	Stone	88½
Ickham	57	Stourmouth	13
Kenardington	17	Stouting	25
Kennington	35½	Staplehurst	260
Kingsnorth	81	Staple	5
Kingston	31	Stelling	37½
Langdon, East	1	Stodmarsh	11
Lenham	2½	Sturry	42
Little Bourne	29	Swingfield	11½
Lyminge	41½	St. Dunstan's	27
Maidstone	3	St. Mary, Breden ..	154½
Marden	498	St. Mildred	2½
Mersham	48	St. Paul	69
Mongeham, Great..	5½	St. Stephen's	16
Ditto Little..	8	Tenterden	310
Moldash	27	Thannington	94½
Murton	3½	Throwley	33
Nackington	76	Telmanstone	7
Newington	5½	Ville Dunkirk	11
Norton	7½	Warehorn	4
Nonnington	19	Waltham	85½
Norrbourne	10½	Westbere	12½
Ospringe	26	Westgate	3
Patricxbourne	21½	Westwell	62½
Petham	126½	Whitstable	4½

Parishes.	Number of Acres.	Parishes.	Number of Acres.
CANTERBURY— <i>continued.</i>		ESSEX.	
Wickham	10	Alphamstoue	2½
Wingham	108	Bardfield, Great ...	1
Whitfield	20	Bocking	4½
Wittersham	206	Braxted, Great, ...	2¼
Willsborough	14	Coggeshall	1
Woodchurch	113	Colne Engaine	12½
Woodnesborough ..	102	Ditto, Earls	15½
Womanswold	1	Finchingfield	10¼
Wooton	8½	Halstead	49
Wye	47	Heybridge	6½
Yalding	25	Hedingham Castle ..	43½
		Hedingham Sible ..	36
		Lamarsh	1½
TOTAL	9,800¾	Maplestead, Great ..	12½
		Ditto, Little	0¼
CHESTER.		Penfield	14
Runabon	0½	Roxwell	3½
		Saling	2
CORNWALL.		Shalford	24½
Gorran	1 ½	Stisted	7½
Manaccan	1 ½	Thorrington	0½
Philliegh	0 ½	Weathersfield	91½
Probus	0 ½		
Ruan	0 ½	TOTAL	342½
St. Anthony	1		
St. Keverne	1	EXETER.	
Veryan	0 ½	Whimple	15
TOTAL	5 ½	GLOUCESTER.	
DERBY.		Dymock	4
Eakring	18	Eldersfield	4
Southwell	96½	Stretton	0½
Rufford	11½		
Upton	6	TOTAL	8½
TOTAL	131½	GRANTHAM.	
DORSET.		Collingham	2½
St. Andrew Mill- borne	16½	Kneesall	18
Tisbury	2	South Muskham ...	8½
		TOTAL	29
TOTAL	18½	HANTS.	
		Ash	3
		Aldersbott	25

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
HANTS—continued.		HEREFORD—continued.	
Albury	2 $\frac{1}{2}$	Bredenbury	32
Binstead	2	Bockleton	101
Bramshott	18	Bishop Frome	450 $\frac{3}{4}$
Crandall	171	Berley	31
Dockenfield	8	Brimfield	38
Elatead	10	Byton	10
Eastmeon	22 $\frac{1}{2}$	Bosbury	305 $\frac{3}{4}$
Farnham	909	Bishopstone	1
Frensham	44	Berrington	3
Froxfield	7	Burford	212
Godalming	3 $\frac{1}{2}$	Clebonger	2
Hawkley	47 $\frac{3}{4}$	Credenbill	10
Headley	28 $\frac{3}{4}$	Callow	8 $\frac{1}{2}$
Hingsley	3	Cannon Pyon	127
Holy Trinity	10 $\frac{1}{2}$	Castle Froome	137 $\frac{1}{2}$
Liss	1 $\frac{1}{2}$	Collington	65 $\frac{1}{2}$
Lurgershall	15 $\frac{1}{2}$	Croft	37 $\frac{1}{2}$
Priors-dean	6	Crudley	346 $\frac{1}{4}$
Puttenham	6	Canon Froome	59
Seal	37	Corley	6
Steep	66 $\frac{1}{4}$	Colwall	161 $\frac{1}{2}$
Stoke	3	Caynham	14
Worplesdon	4	Cleobury	19
Wanborough	28	Cowara	146 $\frac{3}{4}$
Weston	5	Dormington	50
Whetham	3	Dintmore	14
TOTAL	1,490$\frac{3}{4}$	Devereux, Saint ..	4 $\frac{3}{4}$
HEREFORD.		Dewchurch	4
Acconbury	8 $\frac{1}{4}$	Dewsall	14
Allensmoor	2 $\frac{3}{4}$	Dinedor	12
Ashford	14	Docklow	93
Ashperton	68 $\frac{1}{2}$	Ditwyn	149 $\frac{1}{2}$
Avenbury	238	Edwin, Leach	13
Aynestry	24	Edwin, Ralph	96
Ailton	10 $\frac{1}{2}$	Eaton, Bishop	1
Acion Beauchamp ..	131 $\frac{3}{4}$	Eye	79 $\frac{3}{4}$
Bayton	8	Eyton	35 $\frac{1}{2}$
Brinsop	12	Eardisland	125
Burghill	45	Ewyasharold	0 $\frac{1}{2}$
Bodenham	275 $\frac{1}{2}$	Eastnor	15 $\frac{1}{2}$
Bullingham	16 $\frac{3}{4}$	Evesbatch	73
Bridge Sollors	5	Felton	77 $\frac{1}{2}$
Bromyard	616	Ford	14
		Grindon, Bishop ..	113
		Ditto, Warren	30

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
HEREFORD—continued.		HEREFORD—continued.	
Greet	8	Ocle Pitchard	70½
Great Kyre	78	Orleton	85½
Grosmont	11	Pencombe	305
Harewood	2	Puddleston	59½
Hope	166½	Pembridge.....	126½
Haywood	35	Preston	7
Holm Lacey	53½	Putley	8½
Holmer.....	26	Pixley	29½
Hatfield	96½	Pyper and Lye	38½
Hampton, Charles..	25	Rochford	84
Ditto, Wafer ..	24	Richards Castle....	43½
Humber	86½	Saint Weonards... ..	1
Kingsland	205½	Sarnsfield	41
Kimbolton	156	Saint John Baptist ..	13
King's Pion	39	Stoke Edith	44
Kilpech	9	Ditto, Prior.....	127½
Little Hereford....	48	Ditto, Bliss... ..	110
Lugwardine.....	25	Ditto, Lacy.....	157½
Laysters.....	117½	Stamford	38
Lucton	11½	Ditto, Bishop....	128½
Little Cowarn....	84½	Stanton-on-Arrow..	33
Leominster	377½	Sapey	126½
Lindridge	301	Shelwick	14½
Little Marcle.....	28	Suckley	16
Ledbury.....	160½	Stretton Granson..	73
Mancel Lacy.....	3½	Shobdon.....	61
Ditto, Gamage... ..	21	Stretford	18
Mathon	216½	Sutton, St. Nicholas	86½
Much Dewchurch ..	4	Ditto, St. Michael	9½
Mordiford	49	Tenbury.....	352
Marcle	30	Thornbury.....	123½
Moreton on Lugg..	19	Tedstone Delamere	79½
Ditto Jeffries ..	51	Ditto Wafers..	17
Madley	11½	Tarrington.....	83
Marden	152½	Townhope	21
Martins, Saint.....	0½	Tellington	15
Much Cowarn.....	82½	Thruxton	3
Monkland	36	Ullingswick	60½
Middleton	166	Woolhope	64
Munsley	31½	Westhide	66
Mamble	36	Winslow	118
Milson	18	Withington	157
Norton Canou	33	Weston Beggard ..	84
Nun Solars	30	Wormsley	62

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
HEREFORD—continued.		LINCOLN—continued.	
Weobley	20	Sutton-cum-Lound	18
Wellington	92	Tuxford	38 $\frac{1}{4}$
Whitbourne	69	Walesby	32 $\frac{1}{4}$
Warmbridge	2	West Retford	1
Wigmore	4		
Wolferlow	62 $\frac{1}{2}$	TOTAL	573 $\frac{1}{2}$
Yarkhill	106		
Yarpole	58	LYNN.	
Yagor	7 $\frac{1}{2}$	Wretham	0 $\frac{1}{2}$
TOTAL	11,646 $\frac{1}{2}$		
HERTFORD.		NORTHAMPTON.	
Stapleford Abbett..	25	Eaton	1 $\frac{1}{4}$
Limbourn	10		
TOTAL	35	OXFORD.	
		Farringdon	14 $\frac{1}{2}$
ISLE OF WIGHT.			
Boldre	1	PLYMOUTH.	
		Stockenham	4
LINCOLN.			
Askham	46 $\frac{3}{4}$	READING.	
Boughton	126 $\frac{1}{4}$	Bix	0 $\frac{1}{2}$
Bothamsall	3	Hedsor	1
Bevercotes	31 $\frac{3}{4}$	Milton	1 $\frac{1}{4}$
Clarbrough	23 $\frac{1}{4}$	TOTAL	2 $\frac{3}{4}$
Doddington	9		
Durton	3	ROCHESTER.	
Drayton	17 $\frac{3}{4}$	Addington	21
Edwinstow	12 $\frac{1}{2}$	Allington	53 $\frac{1}{2}$
Elksley	17 $\frac{1}{2}$	Ash	134
Egmanton	2 $\frac{1}{2}$	Aylesford	171
Fledgborough	20 $\frac{1}{2}$	Bapchild	54
Heddon-cum-Upton	17	Barming	276
Houghton	3	Bearstead	90 $\frac{1}{2}$
Kirton	18	Bexley	3
Markham, East...	51 $\frac{1}{2}$	Bicknor	3
Ditto West...	4 $\frac{1}{2}$	Birling	105
Normanton	12	Borden	13
Ollerton	17	Bobbing	5
Ordsall	4	Boughton Mon- }	239 $\frac{1}{2}$
Rufford	41 $\frac{3}{4}$	chelsea }	
Sturton	2	Ditto Malherbe ..	97 $\frac{3}{4}$
		Boxley	240
		Brasted	94

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
ROCHESTER—continued.		ROCHESTER—continued.	
Bredgar	25	Hartley	22
Bredhurst	9	Higham	7
Brenchley	40	Igham	172 $\frac{1}{2}$
Broomfield	29 $\frac{1}{2}$	Ilfield	34 $\frac{1}{2}$
Burham	17	Kemsing	45 $\frac{1}{2}$
Chalk	2	Kingsdown	77 $\frac{1}{2}$
Cray, St. Mary	18	Ditto, by Sitting- } Bourne	9
Chevening	58 $\frac{1}{2}$	Luddesdown	50 $\frac{1}{2}$
Chiddingstone	67	Leigh	35
Chelsfield	14	Lullingstone	11
Cudham	26 $\frac{3}{4}$	Limpfield	61
Cuxton	32	Loose	230
Charing	1 $\frac{1}{2}$	Leeds	204
Chart Sutton	317	Langley	136
Cobham	96	Linton	200
Chatbam	50	Leybourne	85
Capel	129	Longfield	19 $\frac{1}{2}$
Crayford	5	Lingfield	19
Crowhurst	1 $\frac{1}{2}$	Lewham	137 $\frac{1}{2}$
Darenth	64	Maidstone	465
Dartford	7	Mereworth	369
Ditton	78	Malling, East	261
Dehtling	39	Ditto, West	212
Doddington	6	Marden	80
Eynsford	9	Milsted	13
Edenbridge	74 $\frac{1}{2}$	Meopham	108 $\frac{1}{2}$
Egerton	5 $\frac{1}{2}$	Milton	8
Eastling	47	Nettlestead	142
Farningham	9	Newnham	12 $\frac{1}{2}$
Faulkham	89 $\frac{1}{2}$	Newington	55
Frindsbury	55	Northfleet	32
Farleigh, East	590	Nursted	23 $\frac{1}{2}$
Ditto, West	152	Orpington	18 $\frac{1}{2}$
Frinsted	16 $\frac{1}{2}$	Oxted	31
Farnborough	3 $\frac{1}{2}$	Otford	36
Gillingham	48	Offham	150
Horton Kirby	137	Otham	177 $\frac{1}{2}$
Halling	4	Otterden	1 $\frac{1}{2}$
Hunton	112	Plumstead	5
Headcorn	166 $\frac{1}{2}$	Penshurst	19 $\frac{1}{2}$
Hollingbourne	67 $\frac{1}{2}$	Peckham, East	614
Hallow	618	Ditto West	112
Harrietsham	38 $\frac{1}{2}$	Pembury	42
Hacking	13	Ryarsh	85
Halstow	3		

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
ROCHESTER—continued.		SALISBURY.	
Ridley	17	Alton	198
Rainham	12	Bentley	147
Rodmersham	22	Binsted	181
Stone ..	43½	Bentworth	0½
Shipbourne	27½	Bramley	9½
Shoreham	51½	Burcombe	1½
St. Margaret	7	Chawton	14
Seven Oaks	215	Cron dall	4
Sundridge	114½	Dogmersfield	3
Seal	162½	Empshott	24
Snodland	39	Farringdon	7
Stockbury	41	Froyle	122
Sutton Valence	206	Greatham	16
Ditto, East	203½	Hawkley	1
Sittingbourne	4	Holyhoun	21
Shorne	48	Headley	1
Southfleet	75½	Hartley	12
Stansted	81½	Heckfield	2
Staplehurst	4	Hartley Wintney ..	3
Statisfield	16½	Kingsley	32
Sutton-at-Home ..	13	Longsutton	57
Stroud	7	Neatham	34
Tatsfield	1½	Newton	8
Tunbridge	474	Odiham	49½
Titsey	13	Romsey Extra	3
Teston	63	Shaldon	8
Teynham	6	Selbourne	86
Thurnham ..	95	Sherbourne, St. }	4
Tonge	9	John's	
Trosley	34½	Warnborough, South	5
Tudeley	148	Worldham, East...	33
Tunstall	15	Ditto, West ..	6
Uleomb	187½		
Upchurch	10	TOTAL	1,093
Wilmington	10½		
Westerham	118½	SALOP.	
Wrotham	667½	Eyton	3
Wateringbury	384		
Witchling	16	STOURBRIDGE.	
Wormshill	16	Abberley	64½
Yalding	912	Astley	38½
		Areckley, King's	14
TOTAL	14,187	Ditton, Prior's	4
		Holt	4

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
STOURBRIDGE—		SUSSEX—continued.	
<i>continued.</i>		Barcomb	131 $\frac{1}{2}$
Lindridge	30	Brenchley	404 $\frac{1}{2}$
Martley	33	Buxted	210 $\frac{1}{2}$
Rock	140 $\frac{3}{4}$	Bidborough	17 $\frac{1}{2}$
Ribbesford	10 $\frac{1}{2}$	Burwash	440 $\frac{1}{4}$
Shrawley	45	Beckley	427
Shelsley	127	Brede	300 $\frac{1}{2}$
Ditto, Beauchamp	5	Brightling	141
Ditto, King's	16	Bexhill	61
Stockton	48 $\frac{1}{2}$	Bury	7
Witley, Great	26	Capel	111 $\frac{1}{2}$
Ditto, Little	30	Chalvington	2
		Chalwood	3
TOTAL.....	641$\frac{3}{4}$	Cowden	65 $\frac{1}{2}$
SUFFOLK.		Cbiddingley	65 $\frac{3}{4}$
Asben	1 $\frac{3}{4}$	Catsfield	49 $\frac{1}{2}$
Bures, St. Mary	0 $\frac{3}{4}$	Crowhurst	54 $\frac{1}{4}$
Asington	1 $\frac{1}{2}$	Cuckfield	5 $\frac{3}{4}$
Combs	3 $\frac{1}{4}$	Chailey	29
Clare	3 $\frac{1}{4}$	Dollington	77
Cornard, Little	1 $\frac{1}{2}$	Ewhurst	437 $\frac{1}{2}$
Finborough, Great	7	Etchingam	178
Foxhall	8	Frant	165 $\frac{3}{4}$
Haughley	27	Framfield	186 $\frac{1}{2}$
Kesgrave	6	Fletching	124
Needham	6	Fairlight	35 $\frac{1}{2}$
Newton	30 $\frac{3}{4}$	Grinstead, East	24 $\frac{1}{4}$
One House	14	Ditto, West	5
Rattlesdon	3	Goudhurst	251
Stowmarket	40 $\frac{1}{4}$	Guestling	37
		Godstone	11
TOTAL.....	154	Hoathley, East	29 $\frac{1}{2}$
SURREY.		Ditto, West	9 $\frac{1}{2}$
Croydon	11 $\frac{1}{2}$	Hastings	40
Kingston	1	Hailsbam	10
		Heathfield	208 $\frac{1}{4}$
TOTAL.....	12$\frac{1}{2}$	Hertsmonceux	83
SUSSEX.		Hamsey	0 $\frac{3}{4}$
Asbburnham	75	Heaver	1 $\frac{1}{2}$
Ashurst	13	Hartfield	42 $\frac{1}{2}$
Battle	204	Hellingley	120 $\frac{1}{4}$
		Horsted	54 $\frac{1}{4}$
		Horsted Keynes	19
		Hollington	38 $\frac{1}{2}$

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
<i>Sussex—continued.</i>		<i>Sussex—continued.</i>	
Hooe	40	Warbelton	152
Horsemonden	10	Warnham	0 $\frac{1}{4}$
Henfield	7	Waldron	100 $\frac{1}{2}$
Horne	2 $\frac{1}{2}$	Westfield	231
Isfield	44	Westmeston	1
Iden	118	Wartling	76
Icklesham	215	Wartlington	97 $\frac{1}{2}$
Lamberhurst	268 $\frac{3}{4}$	Winchelsea	12
Lindfield	20	Wivelsfield	7
Lingfield	36 $\frac{1}{2}$	Worth	2 $\frac{1}{2}$
Laughton	8	Westham	18
Mayfield	635		
Maresfield	68	TOTAL	11,378 $\frac{3}{4}$
Malling, South	2 $\frac{1}{2}$		
Mountfield	153 $\frac{1}{2}$	UXBRIDGE.	
Newick	23	Watford	6
Newenden	15		
Northiam	283 $\frac{1}{4}$	WALES, MIDDLE.	
Ninfield	82	Almeley	22 $\frac{1}{2}$
Nuthurst	5	Clifford	10
Ockley	3	Eardisley	11
Ore	20	Kinnersley	13
Pembury	157 $\frac{1}{4}$	Kinsham	10
Penhurst	109	Moccas	5
Peasmarsh	209 $\frac{3}{4}$	Norton, Cannon ..	3
Pleyden	75	Peterchurch	3
Pett	17	Preston-on-Wye ..	2
Rotherfield	424 $\frac{3}{4}$	Presteigne	7
Reigate	3	Stanton-on-Wye ..	11
Ringmer	2 $\frac{1}{2}$	Ditto on Arrow ...	6
Rye	139	Vouchurch	9
Ripe	3 $\frac{1}{4}$	Winforton	3
Speldhurst	138 $\frac{1}{4}$		
Shipley	5	TOTAL	115 $\frac{1}{2}$
Sandhurst	306 $\frac{1}{4}$		
Salehurst	352 $\frac{1}{2}$	WELLINGTON.	
Sedlescomb	112	Orchard Portman ..	16
Tunbridge	101 $\frac{1}{2}$	Stoke, St. Mary	0 $\frac{1}{4}$
Ticehurst	504 $\frac{3}{4}$	Wembdore	1
Tandridge	46		
Uckfield	86 $\frac{1}{2}$	TOTAL	17 $\frac{1}{4}$
Udimore	269		
Wadhurst	153 $\frac{1}{2}$	WORCESTER.	
Withyham	115 $\frac{3}{4}$	Alfrick	115

<i>Parishes.</i>	<i>Number of Acres.</i>	<i>Parishes.</i>	<i>Number of Acres.</i>
WORCESTER— <i>continued.</i>		WORCESTER— <i>continued.</i>	
Bidford	0 $\frac{1}{2}$	Madresfield	15
Bransford	43	Martley	165 $\frac{1}{2}$
Broadwas.	62 $\frac{3}{4}$	Newland	58
Cotheridge	88	Ombersley	19
Clifton	115 $\frac{1}{2}$	Pirton	1
Cradley	18	Powick	112
Doverdale	5	Sapey, Lower.	37 $\frac{1}{2}$
Doddenham	52 $\frac{1}{2}$	Shelsley, Little.	35
Grimley	42	Saint John's	1
Hallow	15	Saint Peter's	36 $\frac{3}{4}$
Holt	57	Stanford	3
Himbleton	7	Suckley	227 $\frac{3}{4}$
Hanley Castle	43	Tedstone	39
Huddington	2 $\frac{1}{4}$	Upton-on-Severn ..	8
Kenswick	26	Whicbenford	103
Knightswick	40 $\frac{1}{2}$	Whitbourn	186
Leigh	197		
Malvern	65	TOTAL	2,041 $\frac{1}{2}$

Hops exported from Great Britain to Foreign Countries from 5th January 1235 to 5th January, 1836, distinguishing the Countries to which the same have been exported, and also the quantities to each Country.

	Pounds.		Pounds.
Antwerp	65,213	Larvig	162,914
Arundahl	84,631	Leghorn	169
Bombay	463	Lisbon	333
Boulogne	1,565	Lubeck	13,048
Calcutta	790	Madras	784
Callenberg	41,063	Miramichi	140
Cape Good Hope	26,977	New South Wales ..	97,891
Ceylon	778	Ostend	9,333
Christinna	52,808	Rotterdam	2,471
Copenhagen	17,019	Schbien	34,071
Elsineur	48,900	St. Petersburg	5,061
Frederickstadt	42,319	St. Helena	776
Gottenberg	4,013	Swan River	760
Gravelines	3,966	Trieste	969
Guernsey and Jersey	45,865		
Hamburg	289,968	Total lbs.	1,091,659
Isle of Man	35,804		

According to the value as stated below, this amount is 3½d. per pound.

This exportation is equal to 487 ton 6 cwt., of which only 29½ ton was of the growth, 1835, and 74½ ton was of the year 1834, the other portion was made up with old ones. In addition to this, there were 2 tons of foreign hops exported. This great demand in foreign parts for English hops, for this one year would have required all the produce of the Hants collection in the year 1834 to supply it; being a culture over 1,428 acres, at 7½ cwt. per acre nearly. The declared value of the exported hops of the year 1836 was, 16,616*l.*, but the year before 1835 there was 18,926*l.* value exported.

The Consumption of Malt and Hops by Brewers and Victuallers only, in England—one pound of Hops being calculated to each bushel of Malt. The consumption of old duty is given.

	Malt. quarters.	Old Duty. consumed.
1790 ..	2,090,227	£ 84,600
1800 ..	2,224,962	90,058
1810 ..	2,566,391	103,877
1820 ..	2,547,335	95,000
1830 ..	2,364,939	95,723
32 ..	3,235,519	130,961
33 ..	3,731,908	151,052

Quarters of Malt made in 1835.

England....	4,509,857	Required Old
Scotland....	537,444	Duty for this
Ireland.....	294,205	on Hops.
Quarters	5,361,506	£204,247

By this account it will be seen, that, although the population had increased six millions, from the year 1790 to 1830, (from eight to fourteen millions;) yet the increase of malt had not been in the like proportion,—but in the year 1835, when the beer houses were licenced, the increase has been considerable; to keep up, with this increasing demand for malt, a like increase in the demand for hops, may be expected; which, together with the exportations, may be calculated on, as likely to give activity to the hop market; and, if the increase of population proceeds for the next 40 years, as it has done for the last, much more hop, as well as barley land will be required, and then, we may expect to see the present waste lands brought into cultivation.

The annual average surplus of duty grown during the six years ending 1835, over the six years ending 1829—was 31,422 old duty. The average surplus of land during this period was only 1,773 acres; this increase in the quantity of land, upon an average, would have made additional duty 5,850*l.*, whereas the actual surplus duty was 31,422*l.*, which occasioned an annual payment on each acre of 10*s.* 9*d.* extra during the six years ending 1835, the first average being 2*l.* 15*s.* 10*d.*, and the last 3*l.* 6*s.* 7*d.* per acre.

These observations will show that the large crops of the last six years, are not to be attributed to the increase of the plantations; but rather to the seasons and culture, seeing that in the first six years there were two failing crops, viz, the years 1825 and 1829. Old experienced planters will affirm that so many hops are not

now grown per acre as there were 50 years ago, the old work quoted, which was published 258 years ago, speaks of the quantity being 2,400lbs., which is nearly one ton $1\frac{1}{2}$ cwt. per acre.

STATISTICAL ACCOUNT OF THE TRADE OF BRITAIN.

Tables intended to show the proportionable value of Agricultural produce, with the return of the Hop land in England, (without the duty,) also, an account of the trade and commerce of the country for the year 1836.
Superfices of Great Britain.

	Arable.	Meadows.	Uncultivated.	Total.
England ..	10,900,000	14,200,000	7,932,400	33,032,400
Wales	900,000	2,600,000	1,252,000	4,752,000
Scotland ..	2,500,000	2,550,000	17,204,507	22,254,507
Acres ..	14,300,000	19,350,000	26,388,907	60,038,907
		Average produce.		Value.
Wheat	3,900,000	19 bushels 133s.		25,935,000
Oats and } Beans. }	3,600,000	" 30 " 82s.		14,760,000
Barley & } Rye .. }	1,200,000	" 28 " 112s.		6,720,000
Roots.....	1,500,000	Potatoes, Turnips &c 12l.		18,000,000
Clover	1,400,000	" one Ton 4l.		5,600,000
Hops	53,816	7 cwt. without duty 35l.		1,883,560
Fallows ..	2,646,184			
Acres..	14,300,000	Acres.		
Meadows, pastures, and marshes	19,350,000	50s.	48,375,000	
Uncultivated wastes and moors	26,388,907	2s.	2,638,890	
Gross value of the surface produce of Great Britain.....				£123,912,450
Export of British produce and manufactures..				£ 46,926,370
Export of Foreign produce.....				12,783,801
				59,710,171
Importation of Foreign goods.....				47,463,609
Value of trade returns.....				£107,173,780

Duties:—Matt made, £5,540,222.
Hops:—£348,404.

The Hop Duty for the year 1834 was charged to the several districts according to the following table, to which has been added by computation the weight of each division and number of acres of each district with the averages.

Districts.	Growth.		Amount of Duty.	No of Acres.	Average weight per acre.	
	Cwt.	gr. lb.			Cwt.	lb.
Barnstaple ..	43	0 8	£. 40 4 0	8	5½	15
Bath.....	0	0 10	0 1 8	1½	0	4
Bedford	142	1 20	132 18 8	26	5½	1
Bristol	20	3 1	19 7 6	4	5	2½
Cambridge ..	15	3 2	14 14 4	4	3½	21
Canterbury ..	71878	3 16	67086 19 4	9264½	7½	1
Chester	0	3 4	0 14 8	¾	1	4
Cornwall	14	0 15	13 3 10	5½	2½	24
Derby	1205	1 17	1125 0 10	135	8½	18
Dorset	82	0 0	76 10 6	18½	4½	2
Essex	1855	3 10	1773 17 4	330	5½	24
Exeter	99	0 2	92 4 4	13	7½	13
Gloucester ..	4	1 23	4 3 2	9	¼	27
Grantham ..	175	0 16	163 8 4	29	6½	11
Hants	10581	2 10	9876 3 0	1428½	7½	17
Hereford	20548	0 22	19594 12 2	12018	1½	23
Isle of Wight	4	1 16	4 2 0	1	4½	16
Lincoln	5298	1 13	4945 2 10	562½	9½	19
Lynn	4	1 1	3 19 6	1½	2½	24
Northampton	23	1 14	21 16 4	1½	18½	26
Oxford	51	0 3	47 12 6	10	5	11
Plymouth ..	4	3 19	4 11 10	4	1	25
Reading	20	0 10	18 15 0	4½	4	24
Rochester ..	116215	3 17	108468 3 6	13138	8½	10
Salisbury ...	6564	1 2	6126 13 0	1038½	6	27
Salop	0	3 6	0 15 0	3	¼	2
Stourbridge..	1414	0 8	1319 16 0	630½	2½	17
Suffolk	1262	0 24	1182 4 8	148½	8½	3
Surrey	64	0 10	59 16 4	11½	5½	20
Sussex	110295	1 26	102942 9 0	10431½	10½	8
Uxbridge ...	59	0 6	55 8 0	5	11½	5
Wales, middle	48	0 3	44 16 6	119½	¾	17
Wellington ..	134	1 24	125 10 0	17½	10½	—
Worcester ..	4876	0 2	4551 2 1	1848½	2½	10
	353414	2 2	329936 17 9	51273½	av. 6½	16

Old Duty, at 1d. $\frac{11}{16}$ per lb. .. 189713 14 2½ $\frac{11}{16}$

New Duty, at 2d. $\frac{3}{16}$.. 140223 3 6½ $\frac{3}{16}$

Total, at 2d. £ 329936 17 9 = 39,517,497lbs.

The preceding table will much assist the calculation of an accruing duty, by comparing the growth of a district of any year with what it paid in 1834 by the common rule of proportion: thus the growth of a district we will presume will produce $7\frac{3}{4}$ cwt. per acre on the average, as *Canterbury*; then, if the average of $7\frac{3}{4}$ cwt. at *Canterbury* produced 189,713 *gross Old Duty* in 1834, what will 5 cwt. produce, being the presumed average of any year at *Canterbury*?

$$189,713 \times 5 \div 7\frac{3}{4} = \text{£}122,395\frac{1}{2}$$

The number of acres in culture of hops being 51,273 it will give £6 8s. 10d. average duty for every acre; and for the *Old Duty* it gives £3 10s. 1d. duty for every acre of hops grown in the year 1834, the average of that year's growth being 6 cwt. 3 qr. 16 lbs. per acre, over a surface of land about equal to half the extent of the county of Rutlandshire.

In the year 1834 the parish of Farnham alone yielded, and there were pitched at the Blissimere Hall Acre, Weyhill Fair, 3,302 pockets, of nearly $2\frac{1}{2}$ cwt. each, the produce from 818 acres, which gave an average of 10 cwt. per acre; the highest price sold at the fair was £9 5s. per cwt.; therefore there was paid in gross duty £9 6s. per acre at 18s. 8d. per cwt. over the whole parish, a pretty tax this, per acre, as a cheque on the culture of the land.

In the year 1835 there were at Weyhill Fair of Farnham growth only 1,746 pockets, but in the following year, 1836, there were 3,030 pockets, and of the district around Farnham there were 5,100 pockets, which were nearly all sold in the course of the week's fair.

An account of the Duty on Hops of the growth of the year 1835 and 1836, distinguishing the Districts, and the Old from the New Duty.

Districts.	1835				1836			
	Gross Duty.			Acres.	Gross Duty.			Acres.
	£.	s.	d.		£.	s.	d.	
Barnstaple ..	28	16	0	7 3	46	7	0	6 $\frac{3}{4}$
Bedford	142	18	6	26 0	141	17	4	26
Bath	0	0	0	2 2	7	18	8	2 $\frac{1}{2}$
Cambridge ..	26	2	4	4 0	26	12	2	6
Canterbury..	98975	9	8	9800 3	76512	1	0	10815 $\frac{1}{2}$
Bristol	0	0	0	0 0	10	17	8	4
Chester	0	16	2	0 3	1	4	20	1 $\frac{3}{4}$
Cornwall ...	13	14	3	5 1	10	14	8	7 $\frac{1}{2}$
Coventry ...	0	0	0	0 0	0	6	0	$\frac{1}{4}$
Derby	30	17	4	131 2	755	16	3	132
Dorset	15	0	9	18 2	54	7	10	23 $\frac{1}{2}$
Essex	2131	19	2	342 3	1785	7	6	344 $\frac{1}{2}$

Districts.	1835			1836		
	Gross Duty.		Acres.	Gross Duty.		Acres.
	£.	s.	d.	£.	s.	d.
Exeter	14	15	8	15	0	9
Gloucester ..	0	6	10	8	2	7½
Grantham ...	3	4	4	29	0	29
Hants	4386	1	10	1490	3	1611½
Hereford	22734	11	10	11646	2	10542
Hertford	57	19	6	35	0	94
Isle of Wight	0	0	0	0	0	1
Lincoln	350	3	4	573	2	596½
Lynn	0	18	4	0	2	2½
Norwich	0	0	0	0	0	10½
Northampton	0	8	6	1	1	1½
Oxford	26	10	6	14	2	14½
Plymouth ...	5	0	2	4	0	4
Reading	5	1	6	2	3	7
Rochester ..	144681	8	0	14187	0	14846½
Salisbury ...	2464	10	0	1093	0	1154
Salop	0	2	10	3	0	3
Stafford	0	0	0	0	0	½
Stourbridge..	1083	15	0	641	3	653
Suffolk.....	791	17	2	154	0	156½
Surrey.....	3	17	6	12	2	15½
Sussex	127458	14	4	11378	3	12137½
Uxbridge....	9	13	2	6	0	6
Wales, middle	95	4	2	115	2	103
Wellington ..	51	11	4	17	1	17½
Worcester ..	3480	7	11	2041	2	2026½
	409055	18	3	53816	1	55420

This was equal to 438,274 cwt. = 8 cwt. 16 lb. per acre for the year 1835; and 373,290 cwt. = 6 cwt. 2 qrs. 26½ lb. per acre for 1836.

1835 { Old Duty, at 1d. $\frac{13}{10}$ per lb. 235,207 2 11½ $\frac{11}{10}$
 { New Do. at ¾d. $\frac{8}{10}$ per lb. 173,848 15 3 $\frac{11}{10}$

Total £ 409,055 18 3

1836 { Old Duty 200,332 12 11½
 { New Do. 148,071 19 2

Total .. £348,404 12 2

G. A. COTTRELL, First General Accountant.

Excise Office, London, Nov. 27, 1836.

By comparing the growth of the year 1835 with that of 34 and 36, it may be observed, that Bath, Bristol, and other places are thrown out of culture and again brought into the collection, and that the great increase of duty for 1835 occurs in the districts

of Canterbury, Hereford, Rochester, and Sussex; the deficiencies of the year 1835 are in Hants, (which includes Farnham), Lincoln, (including the North Clays, Retford, &c.), Salisbury, and Worcester. These failures are in general on the stiff argillaceous soils under the chalk formation, which it will be observed recover and produce luxuriantly the following year, and those districts which were productive in 35 are in general deficient in 36.

It will require the observance of several years to draw any inferences from these observations as to the cause of the failures: at present the only cause appears to be the excessive attacks of the fly (aphides) at the early growth of the plants, or, as a general inference, that the plant exhausts itself by a great produce, and lays dormant the following year—this being a common opinion amongst the cultivators.

It is truly said, the culture of hops is a speculative crop, that if it was not so they would not be worth growing, that man is naturally fond of a sportive employment—fond of games of chance.

An Account of the Duty on Hops of the growth of the Year 1837, distinguishing the Districts, and the Old from the New Duty.

Districts.	Duty.	Districts.	Duty.
Barnstaple	£. 38 16 4	Lynn	£. 16 5 1
Bath	22 10 2	Northampton....	14 13 0
Bedford	136 10 2	Norwich	48 0 10
Bristol	4 14 3	Oxford	67 15 4
Cambridge	9 8 4	Plymouth	6 6 8
Canterbury	60,511 0 10	Reading	30 6 6
Chester	3 1 6	Rochester	82,680 8 10
Cornwall	12 1 9	Salisbury	5,991 16 6
Coventry	0 6 0	Salop	10 14 6
Derby	944 18 8	Stafford	0 6 4
Dorset	48 5 0	Stourbridge	3,281 4 2
Essex	1,535 18 6	Suffolk	1,002 17 0
Exeter	43 7 10	Surrey	49 14 6
Gloucester	44 2 8	Sussex	80,873 2 2
Grantbam	155 9 10	Uxbridge	4 12 4
Hants	8,464 0 8	Wales, Middle ..	418 18 0
Hereford	48,237 17 4	Wales, West ..	0 4 10
Hertford	847 14 2	Wellington	104 1 10
Isle of Wight ..	2 14 2	Worcester	12,204 3 0
Lincoln	4,702 3 6		
Total			£310,570 14 0

Old Duty at 1d. $\frac{12}{20}$ per lb. 178,578 3 0 $\frac{1}{2}$ $\frac{8}{10}$
 New Duty at $\frac{3}{4}$ d. $\frac{12}{20}$ per lb. 131,992 10 11 $\frac{1}{4}$ $\frac{12}{10}$

Total £ 310,570 14 0

W. COTTRELL, Principal General Accountant.

Excise Office, London, Nov. 14, 1837.

Estimates of the Hop Duty, during five months of their growth, shewing the fluctuations from 1802 to the year 1837; the end of the month is taken as computed in London.

	May.	June.	July.	August.	Sept.	Old Duty paid.
1802	95,000	60,000	40,000	25,000	19,000	£ 15,463
1803	122,000	145,000	165,000	160,000	166,000	199,205
1804	100,000	120,000	157,000	160,000	180,000	177,617
1805	90,000	55,000	34,000	22,000	28,000	32,904
1806	122,000	137,000	152,000	157,000	170,000	153,102
1807	85,000	63,000	50,000	71,000	84,000	100,071
1808	132,000	157,000	196,000	230,000	256,000	251,089
1809	66,000	48,000	48,000	58,000	61,000	63,452
1810	137,000	88,000	74,000	84,000	86,000	73,514
1811	120,000	136,000	160,000	149,000	150,000	157,085
1812	95,000	71,000	52,000	40,000	37,000	30,561
1813	130,000	126,000	143,000	143,000	136,000	131,481
1814	110,000	117,000	150,100	144,000	140,000	140,292
1815	92,000	85,000	77,000	86,000	89,000	123,878
1816	135,000	147,000	141,000	113,000	55,000	46,302
1817	140,000	95,000	93,000	80,000	85,000	66,522
1818	137,000	145,000	111,000	124,000	152,000	199,465
1819	109,000	116,000	131,000	200,000	232,000	242,076
1820	130,000	121,000	101,000	77,000	85,000	133,330
1821	106,000	103,000	132,000	175,000	189,000	154,609
1822	97,000	122,000	129,000	151,000	201,000	208,724
1823	108,000	76,000	42,000	24,000	24,000	26,058
1824	115,000	134,000	142,000	144,000	160,000	148,832
1825	98,000	48,000	19,000	21,000	28,000	24,317
1826	130,000	168,000	191,000	220,000	260,000	269,331
1827	86,000	57,000	85,000	106,000	130,000	140,848
1828	114,000	157,000	187,000	173,000	188,000	172,027
1829	122,000	63,000	40,000	36,000	38,000	38,398
1830	109,000	112,000	104,000	100,000	101,060	88,047
1831	112,000	135,000	140,000	154,000	177,000	174,864
1832	131,000	151,000	155,000	155,000	140,000	139,018
1833	140,000	170,000	180,000	190,000	155,000	156,905
1834	110,000	100,000	95,000	150,000	175,000	189,713
1835	140,000	200,000	220,000	225,000	250,000	235,207
1836	165,000	230,000	200,000	185,000	175,000	200,332
1837	140,000	150,000	170,000	190,000	180,000	178,578

The great disparity between the first month and the last of each estimate, as well as between one year and another, sufficiently prove the uncertainty of this crop; in general, it may be remarked, that the average quotation of the last month very nearly approached the actual duty paid.

SALE OF HOPS.

A comparative scale of the prices of best hops in the Borough of Southwark, at about a month after the yearly announcement of the duty, was to have been added to this Work, with a corresponding scale on a geometrical projection of the duty at the same periods, showing that supply and demand in general regulates the price of the article; that if the quantity grown is greater than can be used for the year, then the price will be low; and if the quantity grown is very deficient of a yearly average demand, then the prices will be high. This proportional scale has not been completed, in consequence of not getting an authenticated list of prices in the Borough, or at any other market, for the last 100 years. For the last ten years, ending 1836, the yearly consumption or growth has averaged £180,616 old duty. A presumed demand may be calculated from the quantity of malt made; that for the year ending January 5, 1836, was 5,361,506 quarters, which taken at 1lb. of hops to each busbel of malt, would be 382,964 cwt. of hops; this at 10s. 8d. per cwt. would give £204,247 old duty, and calculated at 18s. 8d. the gross duty, the amount would be £357,433; hence, the average of the past ten years would not supply hops enough for the yearly make of malt, if the malting is to be continued at the ratio of the year ending January, 1836; this, then, is to be met by an increased breadth of plaoing, or an improved method of culture, so as to produce a greater quantity per acre.

Although it may be advanced that this calculation is not well founded, because much malt is made and used where no hops are required, yet there is to be set in opposition to this the hops which are exported.

The past prices of hops in London in the Autumn of the year of their growth (the top price in November) is given below, as far as they could be collected. For this information, and some other tables of this work, the Author has to return thanks to Messrs. Richardson, hop-merchants, Bridge Foot, Southwark; other information, to complete the comparison, would be thankfully received by the Author. For the prices at Weyhill Fair, the Author has to thank his kind friends at Farnham, so far as they would afford the information.

	Price per cwt.			Old Duty.	
	£	s.	d.	£.	
1566	1	6	8	No duty.	<i>See Appendix.</i>
1787	10	0	0	49,227	
1788	6	0	0	143,168	
1789	8	15	0	104,063	
1790	4	15	0	106,841	
1791	6	13	0	90,059	

Years.	Price	Old Duty		
	£ s.	£.		
1792	4 15	162,112		
1793	10 10	22,619		
1794	4 15	203,663 ^a		
1795	6 5	82,342		
1796	5 5	75,223		
1797	5 10	157,458		
1798	..	56,032		
1799	..	73,279		
1800	18 10	72,928		
1801	5 10	241,227		
1802	12 0	15,463		
1803	6 0	199,205		
1804	5 0	177,617		
1805	8 0	32,904		
1806	6 10	153,102		
1807	6 15	100,071		
1808	5 5	251,089		
1809	6 10	63,952		
1810	9 0	73,514		
1811	7 0	157,085		
1812	16 0	30,561	Hants Duty, in- cluding Farnham.	Price at Weyhill Fair of Farn- ham's.
1813	9 10	131,462		
1814	8 15	140,292		
1815	10 10	123,878		
1816	15 10	46,302	£.	£ s.
1817	33 0	66,522		
1818	8 10	199,465		
1819	4 10	242,076		
1820	3 15	138,330	10,211	11 5
1821	4 4	154,609		
1822	3 10	203,724		
1823	10 0	26,057		
1824	7 0	148,832	7,123	25 0
1825	23 0	24,317		
1826	4 4	269,331		
1827	4 10	140,848		
1828	5 5	172,027	5,512	7 7
1829	9 0	39,866		
1830	10 10	88,047		
1831	5 15	174,864		
1832	9 0	139,018	6,121	11 4
1833	6 0	156,905		
1834	5 10	189,713		
1835	5 0	235,207		
1836	8 10	200,332	9,915	9 10
1837	4 10	178,578		

* This was an over productive year, which affected the price for two following years, although they were very deficient in produce.

† Only $\frac{1}{2}$ swt. to an acre on some ground.

It has been remarked, that if the rate of malt making continues in the ratio of the year, ending January, 1836, there will not be sufficient hops grown for the demand; and, certainly, the New Beer Act having given so much encouragement to the use of the national beverage, there is every reason to expect the demand for hops will continue, particularly if the duty or a part of it should be taken off the malt.

For the past year, ending January, 1837, the malt made in the United Kingdom has been 5,548,463 quarters, an increase on the previous year of 186,957 quarters, and this quantity made and consumed in beer will require a supply of hops to the amount of £211,370 old duty, calculated at 1lb. of hops to each bushel of malt. Of this malt 4,279,468 quarters were used by public brewers, and that there will be this proportional demand it is fair to expect, seeing that there has been as many hops exported during the same period as probably would be saved out of the consumption of malt, if less than 1lb. was used, or a part of the malt consumed in other ways than that of making beer.

The exportation has been 764,834lbs., which would have bittered 95,604 quarters of malt. Of this, 426,342lbs. were sent to Hamburgh, composed of the growth of the several years from 1818 to 1835; the other principal portions were sent to Frederickstadt, Stockholm, New South Wales, &c. Our hops being exported to the ports of the Baltic and the North of Germany, with a remission of the duty, ought to induce our legislature to soften down some of the severe restrictive duties imposed on corn and other land produce coming from the same ports, and our agriculturists should understand, that it is a reciprocity of feeling and acting only, amongst the inhabitants of the earth, can enable us as Britons to maintain our ascendancy as the greatest commercial country in the world.

Old Duty on Hops in particular Districts from 1818 to 1836.

	1818.	1819.	1820.	1821.	1822.
	£	£	£	£	£
Kent	114,719	125,247	59,619	85,436	114,116
Sussex	49,578	78,524	42,600	39,716	48,864
Worcester	22,215	26,036	27,027	22,404	23,225
Farnham & Hants	4,252	5,477	5,111	3,522	10,211
Essex	4,102	3,233	1,859	1,554	3,108
North Clay	3,421	2,542	1,285	1,327	3,162
Sundry small districts in various parts of Britain . }	474	1,014	826	646	1,035
	199,465	242,076	138,330	154,609	203,724

	1823.	1824.	1825.	1826.	1827.
	£	£	£	£	£
Kent	14,677	87,149	7,631	151,539	72,763
Sussex	10,562	39,193	2,040	64,416	41,077
Worcester	4	12,104	11,911	30,649	18,856
Farnham & Hants	667	7,123	1,289	14,650	5,512
Essex	71	1,498	78	3,868	2,217
North Clays . . .	7	1,331	1,341	3,570	191
Sundry small districts in various parts of Britain }	66	430	24	635	228
	26,057	148,832	24,317	269,331	140,848

	1828.	1829.	1830.	1831.	1832.
	£	£	£	£	£
Kent	95,003	31,166	51,607	92,897	71,617
Sussex	43,364	5,732	26,932	42,076	49,683
Worcester	22,118	1,292	2,102	26,364	9,405
Farnham & Hants .	7,074	1,138	4,555	8,534	6,121
Essex	1,740	210	1,126	1,939	783
North Clays . . .	2,428	276	1,540	2,710	1,234
Sundry small districts in various parts of Britain }	297	49	182	341	171
	172,027	39,866	88,047	174,864	139,018

	1833.	1834.	1835.	1836.	1837.
	£	£	£	£	£
Kent	84,952	100,944	140,102	105,515	
Sussex	46,456	59,191	73,288	60,786	
Worcester	17,862	14,668	15,751	19,853	
Farnham & Hants	5,256	9,236	3,941	9,713	
Essex	1,035	1,708	1,696	1,561	
North Clays . . .	1,126	1,584	220	2,209	
Sundry small districts in various parts of Britain }	215	380	205	690	
	156,905	189,713	235,207	200,332	178,578

N. B.—The Fractional parts of these Statements are omitted, although included in the additions.

A Statement of the Number of Brewers in England and Wales.

				Number of Licenses granted.	
				1829.	1832.
				Beer Duty on.	Beer Duty off.
Common Brewers of strong beer, not exceeding					
Exceeding	20	and not exceeding	20 barrels		
	50	"	50	2,854	8,593
	100	"	100	4,871	6,844
	1,000	"	1,000	6,997	9,162
	2,000	"	2,000	11,562	16,828
	5,000	"	5,000	297	619
	7,500	"	7,500	249	488
	10,000	"	10,000	63	124
	20,000	"	20,000	24	71
	30,000	"	30,000	32	89
	Exceeding	"	40,000	5	23
			40,000	2	6
Brewers of T. B. only, not exceeding			40,000	12	16
Exceeding	20	and not exceeding	20	22	51
	50	"	50	8	9
			100	13	12
Retail Brewers of strong beer			100	111	27
				1,279	50

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For an account of the Chemical nature of these composts, see the article "*Manures*" in the "*Hop Farmer*" page 48, also the Note on "*Earths and Bases of Vegetables*" page 156. Of their application on the *Continent*, see *Doctor Granville's* report to the Board of *Directors of the Thames Improvement Company*, by which is shown, the superiority of human soil over all other manures.

The composts are sold in *London* by *MR. RENGRAVE*, 25, *ALBANY STREET*, *REGENT'S PARK*, and by Agents in various parts of the kingdom.

The prices are 1s. 6d. per hushel, in any part of *London* for the *Animalized Carbon*; and 1s. 9d. for the *Carbonized Humus*. Other manures are sold; also, a drilling Machine for the Manure and Seed, at 30s. Sacks for the manure 2s. 3d. each. A *Humus* is prepared as a steep for seed and for watering plants, at 2s. per bushel, quite divested of all unpleasant odour. A similar compost is prepared by the *French*, and sent in great quantities to their colonies, and the same is now recommended to be sent to our *Sugar Plantations* in the *West Indies*.

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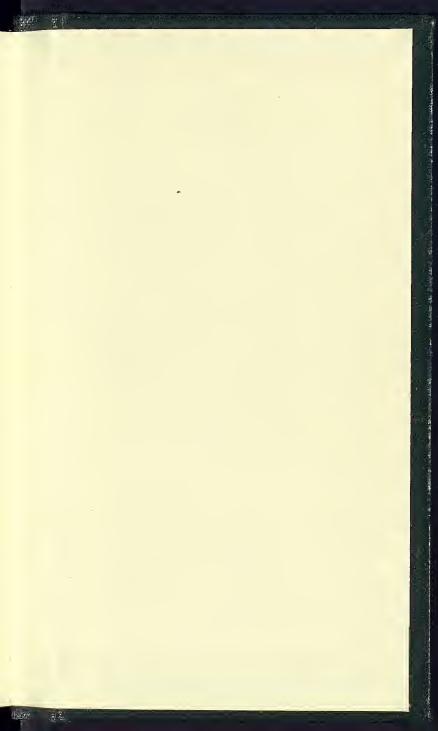
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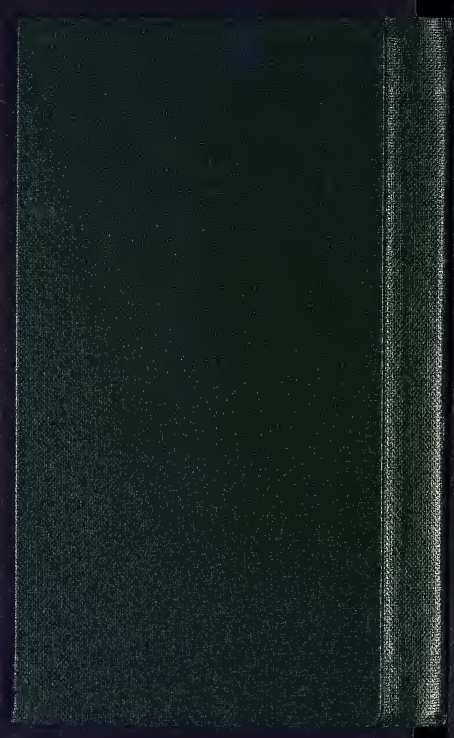
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